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INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LONDON AND
CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY')

CONDUCTED BY

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AND

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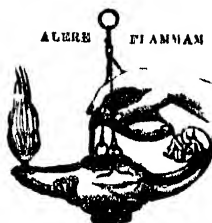
1899.

"Omnes res create sunt divina sapientia et potentia testes, divitiarum felicitatis humana — ex huiusmodi usu *bontas* Creatoris, ex pulchritudine *sapientia* Domini, ex œconomia in conservatione proportionis ratione *potentia* maiestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper astimata, à vere eruditiss et sapientibus semper exulta, male doctis et barbaris semper inimica fuit." —LINNÆUS

"Quel que soit le principe de la vie animale il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef d'œuvre de la Tout-puissance et le but auquel se rapportent toutes ses opérations." BRUCE *Théorie du Système Animal*, Leyden, 1767

. The sylvan powers
Obey our summons, from their deepest dells
The Dryads come and throw their garlands wild
And odorous branches at our feet the Nymphs
That press with mumble step the mountain thyme
And purple heath flower come not empty handed,
But scatter round ten thousand forms minute
Of velvet moss or lichen, torn from rock
Or rifted oak or cavern deep the Naiads too
Quit their loved native stream from whose smooth face
They crop the lily and curl sedge and rush
That drinks the rippling tide the frozen poles,
Where peril waits the bold adventurer a tread
The burning sands of Borneo and Cayenne,
All, all to us unlock their secret stores
And pay their cheerful tribute

J. TAYLOR, *Norwich*, 1818.



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THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES]

“ . . . per litora spargite muscum,
Naiades, et arcum vitreos considite fontes
Pollion virgineo teneros hic carpite flores:
Floribus et pictum divæ, replete canistrum
At vos, o Nymphæ Craterides, ite sub undas.
Ite, recurvato variata corallia trunco
Vellite muscosis e rupibus, et mihi conchas
Ferte, Dem pelagi, et pingui conchylia succo
N. Parthenis Giannettusi, Ed. 1.

No. 19. JULY 1899.

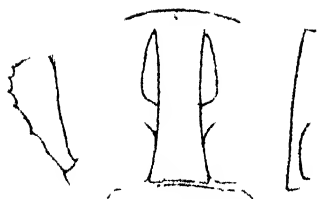
I.—On new Species of Histeridæ and Notices of others. By G. LEWIS, F.L.S.

THE present paper is the sixteenth of a series on the Histeridæ published in this Magazine, and contains descriptions of twenty-eight new species, with notices of others which an increasing knowledge of the family renders desirable.

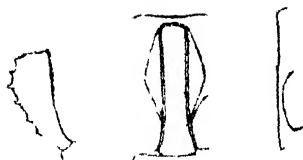
To show some important characters of certain *Saprinæ* I give first an outline of the prosternal keels and tibiæ of *Saprinus cruciatus*, F. (fig. 1), *S. maculatus*, Rossi (fig. 2), and *S. nitidulus*, Payk. (fig. 3), and for comparison figures of the same parts of two species of *Gnathoncus*. Fig. 4 represents *G. rotundatus*, Kugel, fig. 5 *G. nannetensis*, Mars., and of the first an outline of the mandible is also given. Figs. 6 and 7 show the corresponding details in *Hypocaccus 4-striatus*, Hoffm., and *rugifrons*, Payk., respectively; and fig. 8 exhibits the form of the keel, anterior tibiæ, and mandible of *Pachylopus maritimus*, Steph. The side views given of the keels show that those of *S. maculatus* and *cruciatus* continue anteriorly on the same plane as the base, and the other large species, such as *S. semipunctatus*, F., *rasseles*, Mars., *splendidus*, Payk., and *viridanus*, Lew., are formed

Figs. 1-8.

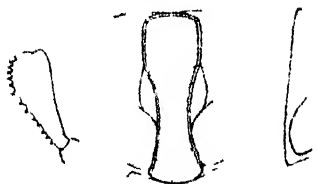
1

*Saprinus cruciatus*, F.

2

*Saprinus maculatus*, Rossi.

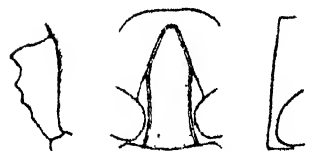
3

*Saprinus nitidulus*, Payk.

4

*Gnathonecus rotundatus*, Kugel.

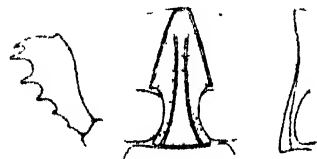
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*Gnathonecus nannetensis*, Muls.

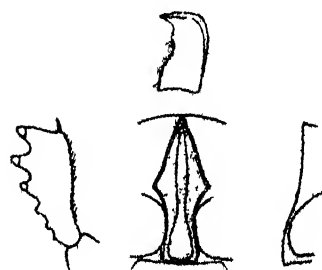
6

*Hypocaccus 4-striatus*, Hoffm.

7

*Hypocaccus rugifrons*, Payk.

8

*Pachylopus maritimus*, Steph.

in the same way; but in *Hypocaccus* the keel is depressed anteriorly, and in *Pachylopus* the depression is much more marked, as shown in fig. 8. In *Pachylopus* and *Hypocaccus* there is another character in common to all the species, the anterior tibial denticulations are more or less diaphanous at the tips (fig. 8); but the principal character which separates these genera from *Saprinus* is the transverse head and frontal carina.

Thomson founded the genus *Hypocaccus* in 1867 (Skand. Col. ix. p. 400), taking as the type *Saprinus 4-striatus*, Hoffm. His generic characters are:—

“Frons antice linea transversa elevata a clypeo discreta. Mandibulæ angulo inferiore dorsali elevato-marginato. Labrum apice truncatum. Tibiæ posteriores spinis validis inter denticulos immixtis, anticæ calvari vix discreta. Elytra apice immarginata, stria marginali discreta, vix in epipleuris sita. Prosterni lineæ longitudinales antrorsum conniventes, approximatae, postice subito divergentes.”

Thomson's genus is a natural one, and the species he assigns to it agree rather with *Pachylopus* than with either *Saprinus* or *Gnathoncus*. But Thomson's generic character “elytra apice immarginata” must be modified to admit *Saprinus apricarius*, Er., *S. consputus*, Mars., and others into the genus, in which the sutural stria is continued along the apical margin. By doing this about forty species may be conveniently placed in *Hypocaccus*. I believe that *Saprinus maculatus*, *semipunctatus*, *splendens*, and others seek their food in carrion and vegetal refuse, and live more or less on the surface of the ground, and in these the prosternum has a flat keel; while the species of *Pachylopus* and *Hypocaccus* burrow in the sand to the depth of some inches, and the shape of the keel, sharpened off anteriorly, must greatly facilitate this action.

The *Saprinini* may soon require revision; but I think the best lineal arrangement of the genera now recognized is as follows:—*Saprinus*, type *nitidulus*, Payk.; *Cheliozenus*, type *xerobates*, Hubb.; *Gnathoncus*, type *rotundatus*, Kugel; *Saprinodes*, type *falcifer*, Low., *Pachylopus*, type *dispar*, Er.; *Hypocaccus*, type *4-striatus*, Hoffm.; *Xenonychus*, type *tridens*, Jacq. Duv.; and *Myrmetes* *picus*, Payk.

Through the kindness of Mr. A. M. Lea I have received a series of Australian species; some of these are from the duplicates of the Macleay Museum and others are from Mr. Lea's own collection. When any reference to these is made in the text it is followed by a number which corresponds to one in Mr. Lea's “Note-book.”

List of Species.

<i>Phylloma angulare.</i>	<i>Hister striola</i> , <i>Sahlb.</i>
<i>Hololepta Mastersi</i> , <i>Macleay.</i>	— <i>sessilis.</i>
— <i>laevigata</i> , <i>Guér.</i>	<i>Carcinops prasinus.</i>
<i>Apobletes solutus.</i>	<i>Stictotrix</i> <i>Lew.</i>
— <i>mundus.</i>	— <i>frontalis</i> , <i>Macleay.</i>
— <i>almeidæ.</i>	<i>Paromalus niponensis.</i>
<i>Platysoma satzumæ.</i>	— <i>mendicus</i> , <i>Lew.</i>
— <i>latimarginatum.</i>	<i>Tribalus</i> <i>Lew.</i>
— <i>bipunctatum.</i>	— <i>tropicus</i> , <i>Lew.</i>
<i>Phelister nigropunctatus.</i>	<i>Saprinus viridanus.</i>
<i>Pachycærus cæruleatus.</i>	— <i>inversus.</i>
— <i>pullus</i> , <i>Gerst.</i>	<i>Saprinodes falcifer</i> , <i>Lew.</i>
<i>Chalcurgus brevipennis</i> , <i>Lew.</i>	<i>Hypocaccus ainu.</i>
<i>Omalodes tuberosus.</i>	— <i>rufipes</i> , <i>Payk.</i>
<i>Campylorhabdus singularis</i> , <i>Sch.</i>	— <i>rubricillæ.</i>
<i>Hister nigrita</i> , <i>Er.</i>	— <i>rubricatus.</i>
— <i>saginitus.</i>	<i>Trypeticus meridianus.</i>
— <i>colonicus.</i>	<i>Pygocelia usambicus</i> , <i>Kulbe.</i>
— <i>tinctus.</i>	<i>Teretriosoma latirostre.</i>
— <i>striatipectus.</i>	<i>Epiechinus tasmani.</i>
— <i>cruciatifrons.</i>	

Phylloma angulare, sp. n.

Oblongum, subconvexum, nigrum, nitidum; fronte leviter impressa; mandibulis extus angulatis, intus dentatis; elytris 2-striatis, striis perspicuis sed brevibus, haud appendiculatis; propygidio conspicue bifoveolato, parce circumpunctato; pygidio dense punctato, cum margine postice lævi.

L. $7\frac{1}{2}$ mill. (absque mandibulis).

Oblong, rather narrow, little convex, black and shining; the head slightly impressed anteriorly, with two short faint striæ, seen only in certain lights, very feebly punctulate in the region of the impression; mandibles obtusely but conspicuously angulate on the middle of the outer edge, inner edges each with a single tooth; the thorax transverse, lateral marginal stria feebly sinuous before the basal angle, basal edge scarcely sinuous; the elytra, lateral fossa rather short and abbreviated at the base and posteriorly continued as a fine stria nearly to the apical angle, the first stria is well marked and as long as a fourth part of the elytron, the second is similar in distinctness but shorter, there is no appendage; the propygidium is conspicuously bifoveolate posteriorly and encircled by punctures, punctures most marked within the foveæ; the pygidium densely punctate, with the posterior margin smooth; the prosternum is obtusely angulate behind and widens out anteriorly to an angle behind the coxæ, and from the angle it narrows again to a point beyond the coxæ;

the mesosternum is widely sinuous behind the prosternal keel, and on each side it is distinctly angulate, the angles are striate at the edge and within the striæ on either side is a small depression or shallow fovea; the anterior tibiæ are 4-dentate, 2 apical teeth are obtuse and close together and have a common base.

The oblong rather narrow outline of this species and the form of the mandibles distinguish it from the ten other species assigned to *Phylloma*.

Hab. Rio Dogua, Colombia (*W. F. H. Rosenberg*). One example.

Hololepta Mastersi, Macleay.

Hololepta Mastersi, Macleay, Trans. Ent. Soc. N. S. Wales, ii p. 157 (1871).

I formerly considered (*Ann. & Mag. Nat. Hist.* ser. 6, xi. p. 418, 1893) that this species was identical with *H. sidnensis*, Mars., 1860; but having lately received examples of both sexes from Mr. A. M. Lea, I find this is an error. Both species are of the same size and closely similar, but in *H. Mastersi* the male has a carina on the mentum, the thorax is impunctate, and the marginal thoracic stria is much less conspicuous in both sexes.

Hololepta lævigata, Guér.

Hololepta lævigata, Guér. Voy. Bélanger, Zool. p. 482, t. ii. fig. 4 (1834).

This species is entered in the Munich Catalogue as a species of *Plæsius*, but it is a *Hololepta*, and a reference to *Plæsius lævigatus*, Mars., is placed after it as though it were the same insect. I think *H. lævigata*, Guér., is the same species as *Hololepta procera*, Er., also described in 1834. I transcribe Guérin's diagnosis, which agrees with Erichson's species in belonging to a *Hololepta* with a frontal tubercle. *Hololepta procera*, Er., was found by M. Mouhot in Siam, and it may therefore occur in Coromandel. It is common in Java and Sumatra, and perhaps M. Bélanger made an error in recording the locality.

Guérin's diagnosis is:—

“*H. nigra*, nitida; corpore depresso, plano, oblongo, capite lævigato, tuberculato; mandibulis validis, inermibus, capite longioribus; thorace lævigato, transverso, antice profunde emarginato; elytris thorace longioribus, lateribus marginatis, lævigatis, linea abbreviata humerali; abdomine vage punctato; tibiis anticis extus tridentatis, intus basi unidentatis.

“L. 15 mill., lat: 7 mill.”

Hab. Coromandel (*Bélanger*).

Apobletes solutus, sp. n.

Oblongo-ovalis, depressiusculus, niger, nitidus; fronte concava, stria integra antice tenuiter impressa; pronoto lateribus punctato, stria laterali pone oculos minute interrupta; elytris striis 1-3 integris, 4 et 5 apicalibus; propygidio pygidioque punctatis; mesosterno late sinuato, marginato; tibiis anticis 4-dentatis.

L. $3\frac{1}{2}$ mill.

Oblong-oval, rather depressed, black, shining; the head, forehead concave, surface finely not thickly punctulate, stria complete, transverse portion rather fine, but it is deep over the eyes, before the eyes the edge is prominent and in front of the projection the edge is bisinuous; the thorax, lateral stria rather strong and close to the edge, and it is disconnected behind the eye with the stria behind the neck, which is straight and crenulate on either side; the sides of the thorax have a band of scattered punctures; the elytra, striæ, there is a very fine oblique humeral close to the base of the first stria, 1-3 complete and all turn feebly inwards at the base, 4 apical and not quite a third of the elytral length, 5 indicated by two or three punctures, sutural wanting; the propygidium with two rather large shallow foveæ on either side behind, moderately punctured, punctures most conspicuous in the foveæ; the pygidium somewhat similarly punctured and very feebly impressed on either side; the prosternum, anterior lobe microscopically strigose, the strigosities ending at the suture, and there are a few punctures scattered over the surface, the keel gradually shelves off at the sides and the want of sculpture on it is conspicuous as compared with the anterior lobe; the mesosternum is very widely sinuous anteriorly, with a rather deep marginal stria which stops abruptly before the base; the metasternum has an independent lateral stria; the anterior tibiæ 4-dentate.

This species is similar to *A. parensis*, Mars., but *parensis* is larger and has no frontal stria. The elytral stria and the foveæ of the pygidium and other small characters also distinguish it.

Hab. Brazil (*H. H. Smith*).

Apobletes mundus, sp. n.

Oblongo-ovatus, complanatus, piceus, nitidus; fronte tenuissimo punctulata, haud striata, basi utrinque breviter sulcata; pronoto marginato; elytris striis 1-3 integris, 4 basi abbreviata, 5 suturalique apicalibus; propygidio sparse grosse punctato; prosterno mesosternoque haud striatis.

L. $2\frac{1}{2}$ -2 $\frac{3}{4}$ mill.

Oblong-oval, flat, piceous, shining; the head, surface even, with extremely fine evenly scattered punctures, at the base on either side are two short furrows, it is angulate on the sides over the eyes and very minutely bisinuous before the angle; the thorax with similar punctures to those of the head, marginal stria complete and close to the edge; the elytra, striae 1-3 complete, 4 shortened at the base, 5 apical, dimidiate, and very feebly oblique, sutural half the length of the fifth only, being shortened apically, it is also slightly oblique; both humeral striae are wanting; the propygidium has some shallow punctures along its base, and a very few similar points are scattered irregularly over the surface; the pygidium has relatively large punctures, also irregular, but more closely set together; the prosternum is without striae; the mesosternum is very widely emarginate, also without a stria; the metasternum has a lateral stria, but the suture between it and the mesosternum is scarcely visible; the anterior tibiae 4-dentate.

Hab. "Usambara, Derema, 850 m. December, 1891. Condrat, S." In the Berlin Museum and my own collection.

Apobletes almeida, sp. n.

(Oblongus, parallelus, depressiusculus, niger, nitidus; fronte fore plana, antice haud striata, punctulata; pronoto stria marginali integra; elytris striae 1-2 et 4 completis, 5 apicali brevissima, suturali basi multo abbreviata, paulum obliqua; propygidio pygidioque irregulariter punctatis; prosterno bistriato, striae anticis divergentibus.

L. 2½ mill.

Oblong, parallel, rather depressed; forehead slightly uneven, without a transverse stria, but marginate over the eyes, surface sparingly punctulate; the thorax punctulate very similarly to the head, but the punctures more distinctly vary in size, hind angles rectangular, anterior obtuse, marginal stria laterally close to the edge, but behind the neck it is further from the margin; along the basal edge there is a row of punctures, but they do not meet before the scutellum; the elytra, striae 1, 2, 4 complete, 3 broken or evanescent in the middle, 5 consists of a very short apical line, the sutural is apical but reaches beyond the middle of the dorsum, and is not parallel to the suture, but gradually widens slightly from it to the apex, the apical border has a few fine punctures; the propygidium is narrowly transverse, with scattered points of varying sizes; the pygidium is semicircular in outline, with a shallow depression on either side at the base, and round the

depressions the outer edge is thickened and raised, the surface punctuation is the same as that of the propygidium; the prosternum bistriate, striæ not joining behind, diverging widely before the coxæ and curved inwards at the tips; the mesosternum is widely sinuous, almost from angle to angle, the marginal stria is complete, and on either side of the sinuosity the margin is widened and thickened; anterior tibiæ 4-5-dentate, with tarsal grooves shallow and nearly straight.

The genus *Apobletes*, as at present constituted, is not capable of exact definition; in both this species and *A. latiusculus*, Sch., the tarsal grooves are shallow and nearly straight, and in two species of the allied genus *Platysoma* from Madagascar the grooves are similarly formed, viz. *P. Richteri*, Sch., and *P. quadricolle*, Lew.

Hab. Madagascar, "Andrangoloaka, alt. 1600 m. O. S. O. de Tananarive."

Platysoma satsumae, sp. n.

Ovale, convexiusculum, nigrum, nitidum; antennis pedibusque rufo-piceis; fronte leviter impressa, stria transversa subarcuata; pronoto anguste marginato; elytris atriis 1 et 3 integris, 2 basi abbreviata, 4-5 apicalibus; propygidio pygidioque profunde punctatis.

L. 4 mill.

Oval, somewhat convex, black, shining; the head feebly impressed anteriorly, stria complete and transversely feebly bowed; the thorax a little arched anteriorly, angles somewhat obtuse, lateral stria well-marked, close to the edge, and continued behind the head; the elytra, striæ 1 and 3 complete, 2 a little shortened at the base, 4 apical but just passing the middle, 5 apical but only reaching the middle, sutural wanting; the propygidium is coarsely punctured (very similarly to *P. confucii*, Mars.); the pygidium is more deeply punctured and the punctures are larger and relatively a little less close, the posterior rim is smooth; the prosternum, keel narrow and without striæ; the mesosternum is rather widely emarginate in front, stria complete, but at the emargination it is very close to the edge, laterally it continues down the metasternum; the anterior tibiæ are 5-dentate.

This species in outline is rather more oval than *P. sincerum*, Sch., but otherwise the general form is similar. It also resembles *P. solitarium*, *elingua*, and *uniforme*, Lew., especially in the thoracic marginal stria being close and parallel to the edge.

Hab. Higo and Satsuma, S. Japan.

Platysoma latimarginatum, sp. n.

Oblongum, subparallelum, depressum, rufo-brunneum; fronte leviter impressa, minutissime punctulata, stria integra; pronoto, stria marginali integra, laterali a margine valde distante antice abbreviata; elytris striis 1-3 integris, 4-6 apicalibus; prosterno bistriato, angustato; tibiis anticis 3-dentatis.

L. 3 mill.

Oblong, rather parallel, depressed, reddish brown; the head, surface with an extremely fine punctuation, not dense, stria complete and fine and widely straight anteriorly; the thorax, marginal stria somewhat carinate and passes the posterior angle, behind the head it leaves the edge and is obscurely crenulate, there is an inner lateral stria some distance from the margin which leaves a very wide interstice, the stria touches the base but is shortened anteriorly at a point in a line with the back of the head, this stria is broad and bends inwards in the middle; the elytra, striæ, external humeral complete, inner humeral wanting, 1-3 rather fine and complete, 4-5 apical and almost reaching the middle, sutural longer than the last two and just passing beyond the middle; there are microscopic punctures on the thorax and elytra; the propygidium has a few large, shallow, and irregular punctures with minute points intermixed; the pygidium is very similar, but the large irregular punctures are transversely disposed near the base; the prosternum, keel narrow, surface with a few minute punctures, bistrate, striæ looped together at the base, outside the striæ the prosternum is minutely strigose, lobe rather wide and distinctly punctured, base semicircular in outline; the mesosternum emarginate, with a short stria on each side at the angles, within these short striæ there is the usual mesosternal marginal stria, which follows the course of the emargination, and then, leaving the edge, passes somewhat obliquely along the side of the metasternum; the anterior tibiæ are 3-dentate.

Resembles *Platysoma constrictum*, Lew.

Hab. Forest Reefs, New South Wales (Lea, 1248).

Platysoma bipunctatum, sp. n.

Oblongum, subparallelum, depressum, rufo-brunneum; pronoto stria laterali integra, utrinque nigro bipunctato; elytris striis 1-3 integris, 4-5 apicalibus, dimidiatis, suturali nulla; prosterno bistriato; tibiis anticis 5-dentatis.

L. 3 mill.

Oblong, rather parallel, depressed, reddish brown; the head

very minutely and sparsely punctulate, stria complete, bowed laterally, nearly straight in front, vertex feebly impressed; the thorax, marginal stria very fine, lateral also very fine, it widens out a little in the median area, and, although very fine, continues round the basal angle, on each side not far from the margin and as near the middle as possible is a small black spot; the elytra, striæ 1-3 complete, 4-5 dimidiate and exactly equal in length, there is no sutural; the pygidia are punctured like those of *P. latimarginatum*.

Beneath, this species is almost exactly the same as the last, except that the surface of the prosternum on either side of the keel is less conspicuously strigose and there are no short striæ at the mesosternal angles; the anterior tibiæ are 5-dentate, basal tooth very small.

This and the preceding species with *P. constrictum*, Lew., constitute a type of *Platysoma* peculiar to Anstralia. The prosternal anterior lobe is very prominent in all the three species.

Hab. Forest Reefs, New South Wales (Lea, 1244).

Phelister nigropunctatus, sp. n.

Ovalis, convexiusculus, rufo-brunneus, nitidus; pronoto utrinque nigro-punctato: elytris striis 1-4 integris, 5 et suturali basi abbreviatis; propygidio pygidioque punctatis; tibiis anticis 4-dentatis.

L. $2\frac{3}{4}$ mill.

Oval, a little convex, rather dark reddish brown, shining; the forehead is clearly punctulate, feebly concave, stria complete, carinate over the eyes, nearly straight in front; the thorax, marginal stria complete, crenulate behind the head, lateral stria fine, parallel to the marginal stria, and terminating just before the anterior angle, surface finely not densely punctured, near the middle but not very close to the lateral margin is a distinct but small circular black spot; the elytra, the bases are narrowly edged with black, and near the scutellum there are six or eight small black spots, and behind them the suture is dusky, the striæ are crenulate, 1-4 complete, 5 and sutural reaching beyond the middle, the sutural is the longest; the propygidium and pygidium are somewhat closely punctured, punctures shallow, the pygidium has a narrow posterior rim; the prosternum, anterior lobe somewhat closely punctured, keel smooth, with two oblique striæ between the coxæ; the mesosternum is widely sinuous anteriorly in the middle, with a short sinuosity on either side of it; across the mesosternum is a fine arched stria, which

approaches near the edge anteriorly and terminates posteriorly without joining the metasternal lateral stria; the metasternum has a longitudinal median sulcus in the anterior area; the anterior tibiæ are 4-dentate, intermediate and posterior tibiæ somewhat widen out gradually to the base.

The tarsal grooves of this species are straight, and in this respect agree with those of *Platysoma exortivum*, Lew. The last Schmidt considers belongs to the genus *Phelister*; so until a new genus is established I follow his views.

Both species are at present unique in my collection.

Hab. Tamworth, New South Wales (*Lea*, 1247).

Pachycrærus æruleatus, sp. n.

Ovalis, supra parum convexus, ærulo-metallicus; antennis pedibusque rufo-brunneis; clypeo impresso a fronte distincto, stria integra valida; pronoto lateribus fortius punctato, stria marginali antice interrupta; elytris striis 1-4, suturali, et humeralibus integris, 5 dimidiata; prosterno bistriato; mesosterno antice marginato; propygidio pygidioque punctatis.

L. 4 mill.

The species is the same size and shape as *P. cyaneus*, Er., and is very similar in sculpture. It differs in the forehead being clearly punctulate, the fourth, sutural, and two humeral striæ are complete (although the sutural stria is somewhat fine and vague at the base), the apices of the elytra are transversely punctured, and the prosternal keel is rather narrower.

Hab. Matadi, Congo River (*J. A. Clark*). Two examples were captured amongst many dozens of *P. cyaneus*, Er.

Pachycrærus pullus (Gerst.).

Platysoma pullum, Gerst. Archiv für Naturg. xxiii. p. 31 (1867).

This species closely resembles *Pachycrærus tenuistriatus*, Lew. I saw Gerstäcker's type in Berlin, and I afterwards sent my type of *P. tenuistriatus* to Herr Kolbe for comparison with it, who has kindly sent me the following note about it:—"*P. tenuistriatus* is larger, the elytra shorter, fourth stria oblique, in *pullus* it is parallel to the third, the punctuation is more dispersed on the elytra and occupies but an apical quarter of them, in *pullus* it occupies half."

CHALCURGUS, Kolbe.

Chalcurgus, Kolbe, Deutsch-Ost-Afrika, iv. Col. p. 100 (1897).

I have seen the two species, *C. cyaneus* and *C. minor*,

assigned to this genus by Kolbe in the museum at Berlin, and it is clear that *Pachycrærus brevipennis*, Lew., is congeneric with them.

Omalodes tuberosus, sp. n.

Breviter ovatus, parum convexus, niger, nitidus. fronte impressa, stria retrorsum acuminata; pronoto ad angulos minute punctulato, stria marginali integra; elytris striis dorsalibus 1-2 integris, 3 punctiformi, humerali externa nulla, interna brevi cum prima dorsali apice connexa; pygidio propygidioque dense subtiliter punctulatis, hoc margine postico tuberculis duobus fortibus, duobusque lateribus minus elevatis; prosterno in medio bistriato; mesosterno antice profunde emarginato et utrinque sinuato, stria marginali late interrupta; tibiis anticis 4-dentatis.

L. 8 mill.

This species differs from *O. tuberculipygus*, Sch., in its shorter form, forehead impressed, not canaliculate, in wanting a sutural stria, in the prosternal stria being shorter, and, above all, by the edge of the mesosternum being sinuous on either side of the median emargination. In a type specimen of *O. tuberculipygus* I have received from Herr J. Schmidt the mesosternal marginal stria is complete.

Hab. Brazil (*ex coll. Barton*).

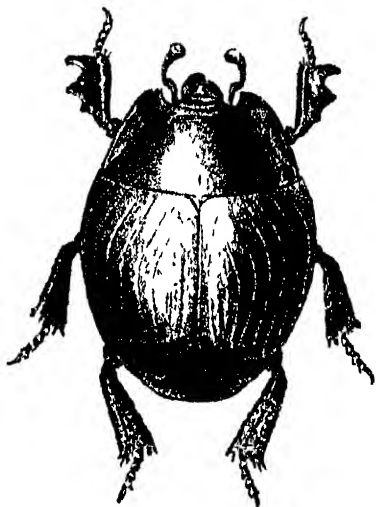
Campylorhabdus singularis, Sch.

Campylorhabdus singularis, Sch. Ent. Nachr. xv. p. 366 (1889).

By the kindness of Herr H. J. Kolbe I am able to give a figure (fig. 9) of the above species. *Hister mtesa*, Ancey, a species very inadequately described, possibly belongs to *Campylorhabdus*, and, if so, it is a far more extraordinary species of the genus than *C. singularis*. The prosternum is narrow behind the coxæ, with two short unconnected striæ, the mesosternum is straight and wide anteriorly and the marginal stria is almost rectangular on either side and is at some distance from the edge. On the first segment of the abdomen there is a wide transverse arched stria. The two humeral striæ are complete, 1-4 and sutural are also complete and join at the base, 5 is apical and dimidiate. Mons. Ancey says nothing about the legs, so it may belong to another genus, but it is similar to *Campylorhabdus*. The particulars I have given of Ancey's species are from a drawing I made some years ago when the type specimen was kindly lent to me by the author. The type is now in Herr J.

Schmidt's collection, having been given to him by Mons. Ancey.

Fig. 9.



Campylorhabdus singularis, Sch.

Hister nigrita, Er., has been found in Mashonaland by Mr. Guy A. K. Marshall eating *Onitis inuus*, F., a beetle of considerable size, and it has also been found feeding on *Aphodii* and small *Onthophagi*.

Hister saginatus, sp. n.

Oblongo-ovalis, parum convexus, niger, nitidus; labro valde emarginato; fronte lata, stria integra; pronoto lateribus ciliato, striis externis basi abbreviatis, internis anticis interruptis; elytris striis 1-3 integris, 4 subintegra, 5-6 dimidiatis; pygidio dense punctato; mesosterno profunde emarginato, stria interrupta.

L. 13 mill.

Oblong-oval, rather convex, black and shining; the head, labrum transverse, anteriorly depressed in the middle, with the anterior edge narrowly but rather deeply emarginate, forehead flattish, stria somewhat fine but complete and nearly straight in front; the thorax ciliate laterally, outer lateral stria shortened at the base and anteriorly hamate and confined

to the angle, inner stria deeper and reaching the base and anteriorly it terminates behind the outer stria and is similarly hamate; the elytra, striæ, inner subhumeral interrupted in the middle and shortened a little at the base, 1-3 complete, 4 shortened at the base, 5-6 approximately dimidiate; the propygidium is densely punctate laterally, punctures in the median area less close; the pygidium is wholly and densely punctate; the prosternum, keel narrow, base spatulate, apical stria oblique, only marginal at the tip; the mesosternum is deeply emarginate, stria interrupted in the middle (this stria is interrupted in all the closely allied species). The anterior tibiæ are 3-dentate, apical tooth very large, intermediate and posterior tibiæ multispinose.

Above, this species is very similar to *H. robusticeps*, Mars.; but *H. robusticeps*, Mars., and *H. fortis*, Sch., differ from the species of the *robustus* group generally in having the anterior lobe of the prosternum marginate. In *H. robustus*, Er., and the species closely similar to it the prosternum is marginate only at the tip, as the stria laterally takes an oblique direction, and in doing so departs from the anterior edge.

Hab. Tschinde, mouth of the Zambesi River.

Hister colonicus, sp. n.

late ovatus, parum depressus, niger, nitidus; stria frontali integra ad oculos angulata; pronoto striis duabus lateralibus validis integris; elytriis striis 1-3 integris, 4 basi evanescenti, 5 apicali, suturali basi abbreviata; propygidio dense punctato, interstitiis longitudinaliter elevatis; mesosterno sinuato, marginato; tibiis anticis fortiter tridentatis.

L. 7-7½ mill.

Broadly oval, rather depressed, black, shining; the head, frontal stria complete and feebly sinuous in front, angulate over the eyes, mandibles broad and bidentate; the thorax transverse, bistriate laterally, striæ deep and complete, with the interstice and border convex, external hamate behind the anterior angle, which is somewhat obtuse, the marginal stria is fine and limited to the region of anterior angle, the inner is broken behind the eye but continued behind the neck, there is a very small linear scutellar puncture; the elytra, striæ, outer humeral wanting, inner deep and shortened well before the base, with a fine oblique appendage on the shoulder, 1-3 strong and complete, 4 fine and evanescent (or sometimes broken) at the base, 5 apical, dimidiate, sometimes broken, sometimes twisted, sutural shortened before the base and arcuate; the propygidium is densely and coarsely punctate,

with ridge-like interstices somewhat longitudinally raised, especially behind the fourth and fifth striae; the pygidium similarly sculptured, except that the interstices are more irregular and less longitudinal; the prosternum, anterior lobe somewhat pointed, with two marginal striae on either side, lateral region punctured; the mesosternum is sinuous and the marginal stria complete, but it does not join the metasternal stria at the suture; the anterior tibiae are tridentate, the apical tooth is very strong.

In its general form this species resembles *H. Lesseleuci*, Mars.

Hab. Dar-es-Salam, Dutch E. Africa.

Note.—The mandibles in *Hister trepidus*, Lew., and *H. Colensoi*, Lew. (1897), are bidentate in the middle of the inner edge.

Hister tinctus, sp. n.

Ovalis, parum convexus, niger, nitidus; fronte foveolata, stria integra; pronoto stria laterali externa basi abbreviata, interna haud interrupta; elytris striae 1-4 integrae, 5 dimidiata, suturali subintegra; propygidio bifoveolato; pygidio parum dense punctato; tibiis latis.

L. $6\frac{1}{2}$ – $7\frac{1}{2}$ mill.

Oval, little convex, black, with a bluish tint on the elytra, shining; the head, forehead foveolate, like that of *Hister cavifrons*, Mars., surface very feebly punctulate, stria complete, sometimes bisinuous, sometimes straighter; the thorax, marginal stria is fine and ceases behind the eye, outer stria commences within the anterior angle and terminates before the base, inner stria is complete and crenulate behind the head and nearly reaches the base, being clearly longer than the outer stria, surface microscopically punctulate; the elytra, striae, internal subhumeral apical and reaching beyond the middle, 1-4 complete, interstice between the second and third rather wide at the base, 5 apical and not quite reaching the middle, sutural arcuate and shortened a little before and behind; the propygidium bifoveolate, not densely punctured, punctures some small and some large, intermixed; the pygidium is more evenly punctured and the punctures are more dense; the prosternum impunctate and without striae; the mesosternum rather deeply emarginate, marginal stria strong and complete; the tibiae, anterior 4-dentate, apical tooth bifid at the apex, intermediate and posterior multispinose.

The tibiae of this species are broad and the tarsi short,

approaching in fact the form in the genus *Contipus*; but it is a *Hister* of the American type, which includes *Hister cavi-frons* and *impressifrons* of Marseul. It is the only species of *Hister* at present known with a bluish tint on the elytra.

Hab. Santarem and Benevides (*H. H. Smith*). Twelve examples.

Hister striatipectus, sp. n.

Breviter ovalis, subconvexus, niger, nitidus: fronte leviter impressa. pronoto stria laterali interna integra; elytris striae 1-2 integrae, 3 interrupta, 4-5 brevissimae, suturali utrinque abbreviata; propygidio pygidioque grosse punctatis: prosterno bistriato.
L. $5\frac{1}{2}$ mill.

Shortly oval, rather convex, black and shining; the head feebly impressed, stria complete, bisinuous anteriorly and sulcate over the eyes; the thorax, inner lateral stria deep, shortened just before the base and continued behind the head, very feebly sinuous behind the eyes, outer stria short and confined to the region of the angle, marginal very fine and ceasing behind the eye; the elytra, striae, inner humeral fine, oblique and basal, outer wanting, dorsal 1-2 complete and deep, 3 basal, dimidiate, with a short apical appendage, 4-5 very short and apical, sutural dorsal, much shortened anteriorly, rather less so behind; the propygidium and pygidium are very coarsely punctate, punctures close but not dense, the punctures are larger than those of *H. coronatus*, Mars., and more closely set; the prosternum is remarkable, it is bordered by a very fine but clear stria, which continues along the base, but anteriorly stops at the suture without turning inwards; the mesosternum is widely sinuous in front, marginal stria complete but abruptly ending before the metasternal suture; the metasternum, lateral stria fine and continued along the anterior suture, being rounded off on either side, not angulate; the tibiae, anterior apically bifid, with four small teeth behind them, hinder tibiae somewhat dilated, tarsi short.

This species should be placed next to *H. Sallei*, Mars. In *H. Sallei* the punctuation of the pygidium is not nearly so coarse, the prosternal striae are similar but do not reach the anterior suture, and the metasternal transverse stria is distinctly crenulate and angulate on either side.

Hab. "Chapada Forest, November" (*H. H. Smith*). One example.

Hister crenatifrons, sp. n.

Orbicularis, convexus, niger, nitidus; antennis pedibusque rufis; fronte utrinque crenata, stria valida semicirculari; pronoto stria interna laterali postice abbreviata, antice post angulum terminata; elytris striis dorsalibus 1-4 integris, 5 et suturali apicalibus; mesosterno marginato; propygidio pygidioque parce punctatis.
L. $3\frac{1}{2}$ mill.

Orbicular, convex, black, shining; the head feebly impressed anteriorly, stria well marked and semicircular, punctuation sparse and microscopical, the anterior edge before the eye is deeply notched, which enables the funiculus or basal joint of the antenna to be raised vertically, and close to it is a second but less conspicuous notch or emargination, the mandibles are microscopically strigous on the upper surface of their bases; the thorax is extremely finely punctulate, marginal stria fine and continued behind the head, internal stria strong and a little oblique; this stria resembles that figured by Marseul for *H. torquatus*, except that it is not hamate anteriorly, but ends abruptly before and behind; the elytra, striæ, humeral external deep but shortened before and behind, internal wanting, but there is a very fine short oblique stria at the base of the first stria, 1-4 dorsal complete, the interstices between the first and second and the third and fourth widen out a little at their bases, 5 apical, not reaching the middle, sutural reaches beyond the middle, but is a little shortened apically; the pygidia are irregularly, not closely nor coarsely punctured; the prosternum is without striæ, keel narrow and triangular at the base, basal edge obscurely concave; the mesosternum anteriorly faintly arched in outline, stria complete, rather fine and close to the edge; the metasternum has a transverse stria less bowed than the mesosternal stria, the stria continues along the sides and widens out before the posterior coxæ; the anterior tibiæ are apically dilated, with one strong tooth near the insertion of the tarsus, but the other teeth are ill-defined.

This species resembles *H. torquatus*, Mars., but the frontal outline, thoracic stria, and other characters easily distinguish it.

Hab. Sumatra (*Doherty*).

Hister striola, Sahlb., n. syn.

The synonymy of this species is *Hister succiola*, Thoms., 1862; *H. japanus*, Motsch., 1860; *H. striola*, Sahlb., 1834.

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Hister sessilis, sp. n.

Orbicularis, convexiusculus, niger, nitidus; pedibus brunneo-rufis; pronoto utrinque impresso stria interna abbreviata; elytris striis 1-5 integris, 5 basi incurvata, apice sinuata, suturali dimidiata; mesosterno arcuato, marginato; tibiis anticis apice dilatatis. Long. $2\frac{3}{4}$ - $3\frac{1}{4}$ mill.

Orbicular, rather convex, black and shining, antennæ and legs brownish red; the head, vertex punctulate, stria strong, complete and distinctly sinuous anteriorly; the thorax, anterior edge bisinuous, internal lateral stria very short, oblique, and terminating anteriorly in a fovea behind the anterior angle, fovea punctate, the stria behind the head is crenulate or punctiform and does not clearly reach the fovea (in some examples this stria is better marked than in others); the elytra, striæ, inner subhumeral discal very short, with a basal oblique appendage, external wanting, dorsal 1-4 complete and somewhat bowed, 5 complete, faintly sinuous behind the middle, very indistinctly incurved before the base, sutural apical reaching beyond the middle and posteriorly turning away from the suture; the propygidium sparsely punctured and the pygidium is smooth (the surface-sculpture of these two segments agrees with those of *H. celestis*, Mars.); the prosternum, anterior lobe with an arched marginal sulcus; the mesosternum is arched anteriorly, with an irregular crenulate marginal stria; the metasternum has a lateral stria some distance within the line of mesosternal stria; the anterior legs are smooth and the tibiæ widen out to their apices, the denticulations are ill-defined.

The species is very similar to *H. celestis*, Mars., and *H. infirmus*, Sch.; I only know the latter by description, but the thoracic stria is interrupted behind the head and the fifth dorsal is formed differently.

Hab. Burmah (coll. H. E. Andrews and my own).

Carcinops prasinus, sp. n.

Ovalis, depressiusculus, viridi-metallicus; antennis pedibusque rufo-brunneis; capite utrinque angulato; elytris striis crenulatis, 1-4 dorsalibus integris, 5 suturalique abbreviatis; pygidio fere lævi; mesosterno antice emarginato, stria marginali integra; abdomine segmento primo utrinque bistriato. L. $1\frac{3}{8}$ mill.

Oval, somewhat depressed, metallic green; the head sparsely punctulate, with a few larger punctures on the vertex, marginate and distinctly angulate over the eyes; the thorax,

marginal stria complete, punctures very similar to those of head, but the larger points are absent on the disk, along the basal edge are oval and larger punctures, but they are less conspicuous before the scutellum, there is no scutellar puncture; the elytra, striæ crenulate, 1-4 complete, 4 bending a little inwards at the base, 5 shortened just before the base, sutural shortened by about one third and punctiform posteriorly, humeral internal fine but entire; the propygidium has a very few transverse scattered punctures, and under the microscope a fine punctuation can be seen on the pygidium; the prosternum, striæ parallel and joined at the base, but not anteriorly; the mesosternum, marginal stria well-marked and complete; the first segment of the abdomen has two lateral striæ on each side.

This species in colour agrees somewhat with *C. viridicollis* and *C. dominicanus*, Mars.

Hub. Vera Cruz (*Herr R. Becker*).

Stictotix Leæ, sp. n.

Breviter ovalis, convexiusculus, obscure brunneus, subnitidus; fronte leviter concava, supra oculos elevata, utrinque inconspicue oblique carinata; pronoto margine elevato; elytris utrinque tricarinatis; tibiis anticis versus medium dilatatis.

L. $1\frac{1}{2}$ mill.

Shortly oval, little convex, brown and somewhat shining; the head feebly concave and very irregularly punctured, punctures varying in size and form, elevated over the eyes, with the elevations continuing as somewhat obscure ridges obliquely down the face (these ridges are not conspicuous like those of *S. Mormoni*, Lew., or *S. frontalis*, MacL.), on the vertex there is a very minute tubercle, only seen in certain lights; the thorax, the lateral edges are somewhat thickly elevated and continued as a stria behind the head, stria partly punctate, partly crenulate; the elytra, epipleural margin, inner and outer humeral striæ are cariniform, dorsal striæ 1-6 complete, but shallow and indistinct, with rows of punctures, more or less regular and similar to those of the thorax, between them; the pygidium somewhat closely punctured and some of the punctures are incompletely circular; the prosternum, the keel is wide and somewhat opaque owing to a densely granulate sculpture, lateral striæ cariniform, especially between the coxæ, before the coxæ the striæ widen out gradually to the lateral edge of the anterior lobe, lobe sculptured like the keel; the mesosternum is bisinuous anteriorly and transverse and narrow, only margined at the sides, and

separated from the metasternum by a straight crenulate stria ; the metasternum and first abdominal segment are rather more clearly punctate than the mesosternum ; the legs slender, with the anterior tibiæ conspicuously swollen before the middle.

The widening out of the prosternal striæ is a generic character in *Stictotix*.

Hab. Windsor, New South Wales (*A. M. Lea*, 1236).

Stictotix frontalis.

Limnichus frontalis, MacL. Trans. Ent. Soc. N. S. W. ii. p. 172 (1871).

Late ovalis, convexiusculus, rufo-brunneus, nitidus ; fronte conspicue bicarinata ; elytris 12-striatis ; metasterno punctato, punctis in medio luniformibus.

L. 2 mill.

Broadly oval, somewhat convex, reddish brown ; the head, surface granulate, vertex concave, concavity bordered on either side with a well-marked oblique carina ; the thorax nearly as wide again at the base as in front, lateral margin narrowly elevated, granulate within the anterior angles and behind the neck, marginal stria behind the head obscurely crenulate ; surface punctuation very distinct, somewhat large, shallow, and not quite circular, the interstices between the punctures are about the width of the punctures themselves ; the elytra, there are twelve striæ on each elytron, that which is apparently the outer humeral is punctiform, the sutural is joined at the base to the third from the suture, the two intervening striæ represent probably one stria formed as two. In *S. Mormoni*, Lew., where the sutural is joined to another in a similar manner, there is only one intervening stria. The interstitial punctuation, so peculiar in this genus, is arranged in rows ; the propygidium and pygidium are coarsely, rather densely, and evenly punctured ; the prosternum, the lateral striæ are fine, carinate, and oblique before the coxæ, the anterior lobe has a rather broad granulate border along the anterior edge and a very few and very much scattered punctures, some incompletely circular ; the mesosternum has punctures set transversely, several are crescent-shaped, the transverse stria is widely crenulate ; the metasternum is curiously punctured, the punctures in the median area are crescent-shaped, on the outer area circular, neither are closely placed ; the legs are slender, tibiæ not dilated ; the antennæ, basal joint nearly as long as all the others together.

The outline of this species is broader than any other of the described species of this genus.

Hab. Clarence River, New South Wales (Lea, 1235). I am indebted to Mr. A. M. Lea for specimens of this species, which have been carefully compared with Macleay's type.

Paromalus niponensis, sp. n.

In the Ann. & Mag. Nat. Hist. (6) ix. p. 33 (1892) I recorded this species from Japan as *P. complanatus*, Panz., but having more recently set up a large series, I find that all the Japanese specimens are different in small but important particulars. The general outline of the body is less oblong—that is, it is relatively broader than *P. complanatus*, the breadth being particularly seen in the width of the thorax and mesosternum; the legs and antennæ are less elongate; the head more distinctly punctured, with the lateral border more elevated; the thorax has the marginal stria minutely interrupted in the middle behind the neck, and the anterior angles are more acute; the sculpture of the pygidium in the male is variable, but it is usually deeper, and the anastomosed sculpture is bordered behind usually with a semicircular furrow; the mesosternum has an indistinct biarcuate transverse stria, and its lateral stria terminates at the base rectangularly. Marseul says the head of *P. complanatus* is smooth, but there are fine and feeble points on the surface; the mesosternum has the lateral striæ hamate at the base, and its transverse stria is fine but very clear and consists of a single arc.

Long. 3–3½ mill.

Hab. Found throughout Japan, chiefly under the bark of beech.

Paromalus mendicus, Lew.

This species was originally found in S. Japan, but in 1890 Herr J. Schmidt informed me that he had received it from Java.

Tribalus Lea, sp. n.

Ovalis, convexus, niger, nitidus; fronte modice prominula, utrinque breviter striata; pronoto sparse punctulato, punctis grossis intermixtis; elytris stria suturalibus antice abbreviatis; prosterno bistriato; mesosterno postice crenulato-striato, stria recta.

L. 2½–2¾ mill.

This species, like several from Eastern Asia, has a sutural stria which diverges from the suture anteriorly. It is extremely like *T. kœnigius*, Mars., but it is more oval, less convex in the dorsal region, the punctuation of the thorax and

elytra more conspicuous, and along the base of the first are some aciculate punctures, the prosternal keel is shorter and the lateral striæ diverge less posteriorly. The forehead also is less prominent over the eyes.

Hab. Cairus, New South Wales. From the Macleay Museum (*Lea*, 1255).

Tribalus tropicus, Lew.

Tribalus tropicus, Lew. Ann. & Mag. Nat. Hist. ser. 5, xvi p 212 (1885).

Herr J. Schmidt has stated (Ann. Mus. Civ. Genova, ser. 2, xvii. (xxxvii.) p. 294, 1897) that the above species is *T. Doriae*, Mars. *T. Doriae* is opaque and depressed, and the dorsal punctuation is obscure. *T. tropicus* is convex, with ocellate punctures, and resembles *T. kœnigius*, Mars. I found *T. Doriae* at the same time as *T. tropicus*, and I may have sent Herr Schmidt a specimen of the first instead of the second; but there is no near resemblance between the two species.

Soprinus viridanus, sp. n.

Ovalis, æneo-viridis; fronte punctata, stria integra; pronoto lateribus impressis grosse punctato, stria integra margini approximata, antice in medio angulata; elytris striis subhumerali externa distincta, interna disjuncta brevissima, 1-3 dimidiatis, 4-5 utrinque, suturali basi, abbreviatis; prosterno plano, bistriato; mesosterno antice immarginato; tibiis 4-dentatis.

L. $7\frac{1}{2}$ mill.

Oval, brassy green, thorax rather more brassy than the elytra; the head transverse, surface rather densely punctured, with a small median fovea on the vertex, stria complete, feebly bisinuous in front; the thorax with a lateral band of coarse punctures, with rugose oblique interstices in the middle of the band, punctuation behind the neck very fine, disk and base smooth, lateral striæ complete and distinctly angulate in the middle behind the neck; the elytra, striæ, humeral external complete, internal short, straight, and basal, 1-3 oblique at base and extending beyond the middle, 4-5 basal and curved, sutural apical, fine, and reaching beyond the middle, the elytra posteriorly and the pygidia are rather finely and not densely punctured; the prosternum, the keel is truncate anteriorly and widens out a little to the base, the lateral striæ follow the outline of the keel and terminate just before the base; the mesosternum has a short rather deep stria on either side; the mesosternal stria is separate and oblique, and


reaches halfway down the segment; anterior tibiæ 4-dentate, the basal tooth is very small.

This species is similar to *S. semipunctatus*, F., *rasselas*, Mars., and *splendens*, Payk. The mesosternal stria is interrupted as in *rasselas*, but it is not joined to the metasternal lateral stria. The sutural stria is finer than in any of these species and the angular course of the marginal thoracic stria behind the neck also distinguishes it from them all.

Hab. N.W. Australia, Macleay Museum (*Lea*, 1221).

Saprinus inversus, sp. n.

Breviter ovalis, convexus, ater, nitidus; fronte punctata, haud impressa; pronoto lateribus punctatis; elytris stria dorsaliibus validis, 1-2 ultra medium, 3 utrinque, abbreviatis, suturali cum 4 coeunte nec apicem attingenti; tibus anticis 9-10-denticulatis. Long. $5\frac{3}{4}$ mill.

Shortly oval, convex, black and shining; the head punctate, punctures fine before the neck; the thorax punctate laterally, stria complete; the elytra, striæ, inner humeral short, basal and oblique, 1-2 dorsal nearly equal in length and reaching beyond the middle, 3 short, discal, with a minute basal appendage, 4 as long as the second and joined to the sutural, the last is slightly shortened at the apex, the outer half of the apical margin is striate; the propygidium and pygidium are densely punctate in ♂, ♀ with a transverse sulcus before the apex of the pygidium, sulcus broad and deep and formed like two connected half-circles, thus ; this segment is only punctate before the sulcus; the prosternum, the lateral striæ leave the keel at the coxæ, and widening out terminate anteriorly in a fovea; the mesosternum is marginate and feebly sinuous in front, and a straight crenulate stria separates it from the metasternum.

This species is extremely similar to *S. aterrimus*, Er., but the fourth dorsal stria is discal and the acumination of the pygidium between the two parts of the sulcus points towards the head. In *S. aterrimus*, Er. (*Ann. & Mag. Nat. Hist.* (6) iii. p. 287, 1889), the acumination is anterior to the sulcus and points in a reverse direction. In the female of both species it is only the anterior part of the pygidium which is densely punctate. In *S. aterrimus*, Er., the third dorsal stria is basal and very rudimentary.

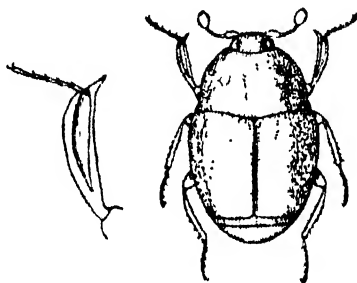
Hab. S. Catharina, Brazil.

Saprinodes falcifer, Lew.

Saprinodes falcifer, Lew. Ann. & Mag. Nat. Hist. ser. 6, viii. p. 395 (1891).

I give a figure of this curious Australian species (fig. 10) and an enlarged outline showing the form of the anterior tibia.

Fig. 10

*Saprinodes falcifer*, Lew.*Hypocaccus ainu*, sp. n.

Ovalis, convexus, æneo-niger, nitidus; fronte obscure rugosa, carina valida; pronoto post. oculos foveolato; elytris striis 1-4 dorsalibus dimidiatis, 4 cum suturali arcuatim juncta; pygidio punctato et transversim rugoso; tibiis anticis valide 4-dentatis.

L. 3 mill.

Oval, convex, coppery black, shining; the head, clypeus rugose, frontal carina strong and angulate on either side, upper surface somewhat obscurely and very irregularly rugose, the rugosities are confined to the anterior half; the thorax is densely punctured at the sides, with a broad band of punctures along the base and a narrow one behind the neck, disk feebly punctulate, marginal stria angulate at a fovea behind the eye and straight behind the neck; the elytra, outer sub-humeral stria is wanting, inner short and dimidiate with an appendage split at both ends, striæ 1-3 nearly equal and reaching the middle, 4 as long as the third and joining the sutural at the base, the surface is punctured only behind the striæ, the sutural stria is not continued along the apex; the propygidium is densely punctured; the pygidium is somewhat similarly pointed, but except at the apex it is transversely rugose; the prosternum is markedly

widened triangularly at the base and the striæ gradually meet anteriorly; the mesosternum is margined anteriorly, with a transverse crenulate stria at the base; the anterior tibiæ 4-dentate.

This species is not much like any other species I know. *H. varians*, Sch., a common Japanese species, has no mesosternal transverse stria.

Hab. Ishikari River, Yezo. I obtained this species from a Japanese I sent to collect insects in Central Yezo in 1882.

Hypocaccus rufipes, Payk.

I found an example of this species at Enoshima, near Yokohama, in May 1880. This is the first record of its occurrence in Japan.

Hypocaccus rubicillæ, sp. n.

Ovalis, niger, nitidus, elytris partim rufis, capite thoraceque impunctatis, mesosterno margine late interrupto, tibiis anticis 6-dentatis

L. 2½ mill.

Oval, black, shining, the elytra red, with the scutellar disk and posterior margins obscurely black; the head and thorax smooth and impunctate, without striæ or sulci, the first has a well-marked carina, the second a fine marginal stria which continues in front close along the edge; the elytra finely, not closely, punctulate apically—striæ, external subhumeral wanting, internal short and apical, with a fine basal oblique appendage, dorsal 1-3 short, not reaching the middle, very fine, oblique, and punctate or punctiform, 4 very short and indicated on the disk by only a few small points, 5 absent, sutural apical and anteriorly punctiform; the pygidia are very evenly and very finely, not densely, punctured; the prosternum, keel narrow, but widening out a little at the base, striæ cariniform, parallel, joining in front and looped together posteriorly at the widening out of the keel; the mesosternum, marginal stria somewhat deep and confined to the anterior angles, it does not join the metasternal stria; the metasternal stria is oblique and longer than the mesosternal stria; the first abdominal segment is clearly punctured, but there are very few points in the central area; the anterior tibiæ are 6-dentate and the posterior tarsi are very robust.

This species is remarkable for its coloration, and its head and thorax are impunctate, like those of *Pachylopus dimidiatus*, Ill.

Hab. Nguela, Usambara. In the collection of the Royal Museum at Brussels and my own.

Hypocaccus rubrioatus, sp. n.

Parum late ovalis, convexus, niger, nitidus, elytris partim rufis; fronte punctata, triangulariter carinata; pronoto marginato, punctato; elytris striis dorsalibus 2-4 magis abbreviatis, 1 longiore, 4 arcuatim cum suturali juncta, subhumerali externa nulla, interna brevi, disjuncta; pygidio aequaliter et sat dense punctato.
L. 2½ mill.

Rather widely oval, the elytra behind the shoulders being a little prominent, black, with the elytra laterally broadly red, and at and near the humeral angles this colour extends across the interstices of the first and second striae; the head evenly and clearly but not very densely punctured, with a well-marked sinuous carina separating the epistoma from the head, and being continued behind obliquely meets on the vertex and thus incloses a triangular space—there are also carinae over the eyes which join the anterior sinuous carina, these ocular carinae are feebly sinuous before the eyes; the thorax, marginal stria complete, punctuation somewhat similar to that of the head, but rather more dense in the regions of the anterior angles and less dense on the disk; the elytra, striae, subhumeral internal broken in the middle, posterior part short, anterior part oblique, external wanting, first dorsal shortened before the apical margin, incurved at both ends, second and third incurved at the base and posteriorly scarcely reaching beyond the middle, fourth very similar to the third but arched at the base and joined to the sutural, which is complete, all the dorsal striae are rather strong, the punctuation is similar to that of the thorax and is confined to the region between the fourth and sutural striae and to the apical area behind the second, third, and fourth striae; on the propygidium and pygidium the punctures are closer but similar; the prosternum triangularly widens out behind the coxae and is bistriate, striae do not touch the base, but join anteriorly, in front of the coxae they run close and parallel to each other along a very narrow keel; the anterior tibiae are somewhat dilated and are 7-denticulate.

This species is not much like any previously described, but it belongs to Marseul's section of *Suprinus* with "un seul chevron sur le front." The prosternal striae before the coxae are much nearer together than those of *H. rugifrons*, Payk.

Hab. Frere (Natal); taken in carrion by Mr. Guy A. K. Marshall (no. 1447).

Trypeticus meridianus, sp. n.

Oblongus, cylindricus, niger, nitidus, pedibus rufo-brunneis; fronte triangulata, minutissimo strigulosa; rostro apice minute bituberculato; pronoto antice arcuatim depresso; propygidio pygidioque utrinque bifoveolatis.

L. $3\frac{1}{2}$ mill.

♀. Oblong, cylindrical, black, shining, legs reddish brown; the head, face triangular and slightly concave, rostrum rather short and terminating in two small tubercles, surface microscopically transversely strigose, with some irregular punctures on the vertex; the thorax is of the same length as the elytra, with an arcuate depression behind the neck, punctuation clear and most dense anteriorly, without a scutellar fovea or puncture, lateral marginal stria well marked; the elytra, punctuation less close than that of the thorax; the propygidium and pygidium are punctured very similarly to the elytra, and both have a conspicuous fovea on either side at their bases; the prosternum is a little longer than broad, rectangular, with a marginal well-marked stria at the sides, and continuing in front but not along the base, surface irregularly not densely punctured; the mesosternum is truncate and immarginate anteriorly, laterally behind the coxæ is a shallow rather broad sulcus with its outer edge raised and turned in anteriorly, surface rather sparsely but evenly punctured; the metasternum is punctate like the mesosternum and has a fine median line. In a second specimen the foveæ in the pygidia are more shallow and less conspicuous.

This species is similar to *T. Gestroi*, Mars. (which is known to me by description only), especially in the form of the head and rostrum. In *T. Gestroi* the prosternal striæ are continued along the base and there are no foveæ in the pygidia. The male is unknown at present.

Hab. Lombok, at an altitude of 2000 feet, in September 1896 (*H. Fruhstorfer*).

Pygocælis usambicus, Kolbe.

Pygocælis usambicus, Kolbe, Deutsch-Ost-Afrika, iv. Col. p. 104 (1897).

I am also much indebted to Herr Kolbe for examples of this species and for giving me a drawing (fig. 11), here reproduced, of his specimen. The surface of the pygidium is wholly excavated in the male, leaving only a narrow rim as a posterior margin; in the female the surface of the pygidium

is concave. This confirms the sexual characters I gave for *Pygocælis* (Ann. & Mag. Nat. Hist. ser. 6, xx. 1897, p. 364). Herr Kolbe's species is highly typical of the genus.

Fig. 11.

*Pygocælis usambicus*, Kolbe.*Teretriosoma latirostre*, sp. n.

Oblongum, cylindricum, nigrum, nitidum, undique sed inæqualiter punctatum; antennis tibiisque rufo-brunneis; pygidio convexo; mesosterno, stria marginali in medio interrupta, metasternoque grosse punctatis; tibiis anticis 6-spinosis.
L. 2½ mill.

Oblong, cylindrical, black, shining; the head evenly, not closely, punctured, with a fine but clear carina over the eyes, nose broad and robust; the thorax, marginal stria laterally well-marked, fine along the anterior edge, punctuation larger than that of the head, especially along the base and before the scutellum, and the punctures are sometimes ocellate; the elytra have one rather well-defined oblique stria outside the middle of the base, the dorsal punctures are larger and more distinctly ocellate than those of the thorax, and in the dorsal region the interstices are faintly and rather irregularly longitudinally raised; the propygidium is clearly and somewhat evenly punctured, punctures distinctly ocellate when seen under the microscope; the pygidium is convex, with the punctures more sparse and finer on the median area; the prosternum margined laterally before the coxæ and coarsely, not closely, punctate; the mesosternum, marginal stria fine, not well-marked, and interrupted in the middle, coarsely punctured; the metasternum, lateral stria curved anteriorly, turning towards the suture, and not joined to the mesosternal stria, punctures most scattered in the median region; the first segment of the abdomen has smaller and closer punctures. The antennæ are reddish brown, also the tibiæ and tarsi, femora darker; the anterior tibiæ are 6-, intermediate 5-, posterior 4-5-spinose.

This species differs from the others I am acquainted with in having a broader nose, and the anterior tibiæ are spinose rather than dentate.

Hab. Brownville, Texas (*Wickham*). One example.

Epiechinus tasmani, sp. n.

Orbicularis, convexus, subnitidus, niger, setosus; antennis rufis; fronte in medio carinata, utrinque punctata; pronoto utrinque bicarinato; elytris 6-costatis; propygidio utrinque late impresso; pygidio irregulariter punctato.

L. 1½ mill.

Nearly circular in outline, convex, somewhat shining, black and setose; antennæ wholly red, thighs red on the inner surface; the head, there is a well-marked median carina and one on either side of it midway between it and the lateral margin; the thorax, the lateral edge is carinate and there is an inner carina parallel to it, with a rather wide interstice between them, behind the neck are four short carinæ; the elytra, the outer margin, one humeral stria and first dorsal stria are strongly carinate, and there are two others and a sutural less elevated; the propygidium is transversely and widely impressed on either side, the impressions nearly meeting in the middle; the pygidium has one or two very large punctures and smaller ones mostly differing in size from one another; the prosternum, anterior lobe with large deep punctures, keel wide, with lateral striæ hamate anteriorly, surface of keel with a few small irregular points; the mesosternum widely bisinuous, sternal pits shallow and widen out transversely before and behind; the metasternum has round punctures much larger than those of the mesosternum, and most numerous in the median area, along the edge behind the sternal fovea is a strong carina.

Hab. Cairus, New South Wales, from the Macleay Museum (*Lea*, 1233). It is probable that many species of this genus occur in Australia.

II.—*Rhynchotal Notes*.—Heteroptera: Scutellerinæ and Graphosominæ. By W. L. DISTANT.

HAVING commenced the rearrangement, with large incorporations, of the fine collection of Rhynchota in the British Museum, the work of the late Francis Walker naturally calls for revision, which I have attempted in this paper so far as

the Scutellerinæ and Graphosominæ are concerned. All Walker's species which relate to these two subfamilies are reviewed in the following pages. I have also had all Westwood's types which he described in the 'Hope Catalogue' before me as I worked through the species. Some new species and genera are described.

Walker's type-specimens missing from the collection call for some remark. These disappearances, however, are not confined to the Rhynchota. Dr. Butler appears to have found similar lacunæ in the Zygenidæ. Writing on this subject (Journ. Linn. Soc., Zool. vol. xii. p. 402, 1876) he remarks:—"Mr. Walker comes one day and describes a new species; but, owing to the lateness of the hour, or some other cause, omits to label it as a type; the next time he comes to the collection he continues his MS., and, finding this species without a label, forthwith redescribes it. This will, I think, account for several instances which I have noticed of evidently the same species described twice over in consecutive pages of Walker's Catalogues." Again (*loc. cit.* p. 432):—"He neglected to label his type, it got mixed up with the other Arctiidæ in the collection; and the label appeared in the cabinet with no specimen to represent Walker's species." One other reason may be predicated. He never labelled the specimens; he was an industrious though, it must be added, reckless describer, and it seems probable that when he sometimes discovered his mistakes he shifted the specimens to more proper positions and maintained a discreet silence as to the process. Hence the specimens are doubtless in the collection, but in other places and under other names.

SCUTELLERINÆ.

Genus COLEOTICHUS.

Coleotichus excellens, Wulk. Cat. Het. i. p. 3 (1867).

The three specimens on which Walker founded his species were unlocalized, and "*patria ignota*" appears against the name in the catalogue of Lethierry and Severin. The British Museum now possesses a specimen from Queensland, and my own collection contains one from Samoa.

A character generally present, and found in two of the three typical specimens of Walker, is a small but distinct levigate ochraceous spot near each basal angle of the scutellum, which also possesses three or four small black spots—two transversely placed and wide apart before middle, and

two close together (sometimes only one) on the slight central keel about one third before apex. The pronotum also possesses two small black spots situate a little before anterior margin.

Coleotichus borealis, sp. n.

Ochraceous, thickly and coarsely punctate; margins of the head and pronotum stramineous, inwardly demarcated with metallic green punctures on the head, very obscurely so and only near anterior margin of the pronotum. Scutellum with a distinct levigate stramineous spot near each basal angle, and with a few very small discal black spots, situate two close together on each side before middle and two, also close together, on central median line about one third before apex. Corium with a dark metallic olivaceous subcostal margin. Body beneath, legs, and antennæ pale ochraceous. Pronotum with two small black spots a little before anterior margin.

Long. 17-19 millim.; exp. pronot. angle 10 millim.

Hab. Formosa, Lak-ku-li (*Hulst*). Two specimens (Brit. Mus.).

This species is closely allied to the Australian *C. excellens*, Walk., both in size and markings. It is separated, however, by the different coloration—ochraceous, not ferruginous—by the broader, more gibbous, and posteriorly less attenuated body, uniform colour of the sternum, &c. This is the most northern species of the genus yet described.

Coleotichus fuscus.

Coleotichus fuscus, Vollenh. Faun. Ind. Neerl. i. p. 59 (1863).

Coleotichus sordidus, Walk. Cat. Het. i. p. 1. n. 4 (1867).

DAMELIA, gen. nov.

Body short, about one and a half times as long as broad, gibbous, deflexed towards head and apex of abdomen. Head almost twice as broad as long, lateral margins moderately sinuated, apex rounded; antennæ of five joints, second and third joints almost equal in length. Pronotum with the anterior margin moderately concave, lateral margins obliquely convex and laminate, basal margin in front of scutellum nearly straight. Scutellum with a large but faint circular impression on each side near base. Sternum with a central canal, the edges of which are raised.

I have placed this genus near *Steganocerus*.

*Damelia circuliferus.**Sphærocoris circuliferus*, Walk. Cat. Het. i. p. 7. n. 18 (1837).Australia (*Damel's coll.*).

Genus SPHÆROCORIS.

*Sphærocoris ocellatus.**Tetyra ocellata*, Klug, Symb. v. pl. xliii. figs. 1-3 (1834).

This species is generally distributed throughout South and East Africa. The British Museum contains specimens from Angola, from which locality also comes the West-African species *S. annulus*. This is the only locality known to the writer in which both species occur.

*Sphærocoris annulus.**Cimex annulus*, Fabr. Syst. Ent. p. 697 (1775).*Sphærocoris annularis*, Westw. in Hope, Cat. Hem. i. p. 13 (1837).

This truly West-African species, like others from the same area, seems gradually spreading eastwards across the continent. In the British Museum is a specimen collected by Mr. Scott Elliot in the district between Salt Lake and Wawamba Country in East Central Africa.

Sphærocoris pæcilus, Dallas, List Hem. Ins. i. p. 9 (1851).

This species, originally described from Gambia and re-described by Stål from Nubia, was found by Mr. Scott Elliot in the same district of East Central Africa as *S. annulus*.

Genus ASOLENIDIUM.

*Asolenidium unicolor.**Sphærocoris*? *unicolor*, Dallas, List Hem. Ins. i. p. 7 (1851)Var. *flavonotatus*.*Sphærocoris*? *flavonotatus*, Dallas, *loc. cit.* p. 7.Var. *olivaceus*, nov.

Above dark uniform olivaceous, beneath piceous; head beneath, prosternum, and femora dull castaneous; tibiæ and tarsi piceous.

Hab. West Africa, Cameroon Mts. (Brit. Mus.).

Genus HYPERONCUS.

Hyperoncus cyaneosparsus.

Sphærocoris cyaneosparsus, Walk. Cat. Het. i. p. 6. n. 17 (1867).

Genus CANTAO.

Cantao rudis.

Cantao rudis, Vollenhoven, Faun. Ind. Neerl. i. p. 60 (1863).

Cantao incitus, Walk. Cat. Het. iii. p. 506 (1866).

Cantao consilius, Walk. Cat. Het. iii. p. 507.

Genus TECTOCORIS.

Tectocoris lineola.

Cimex lineola, Fabr. Spec. ii. p. 340 (1781).

Tectocoris pusillus, Walk. Cat. Het. i. p. 13 (1867).—Appertains to the variety *Banksi*, Don.

Tectocoris obliquus, Walk. loc. cit. p. 13.—A variety near that known under the name of *diopthalmus*, Thunb.

Tectocoris amboinensis.

The typical specimen on which this species was founded is destroyed, only the "head" being now contained in the National Collection. From the description it seems clearly to have been nothing but a variety of *T. lineola*, Fabr., var. *cyanipes*, Fabr., and may therefore be erased from our nomenclature.

Genus PÆCILOCORIS.

Pæcilocoris Hardwicki.

Tectocoris Hardwickii, Westw. in Hope Cat. i. p. 13 (1837).

A specimen of this species, originally in the East-Indian Museum and now contained in the National Collection, has the following label attached:—"Tea-shrubs at Tengrac (Feb. 24, 1836); said to infect the plant particularly.—Near Boutan."

Pæcilocoris Hardwicki, Westw. (*supra*).

Pæcilocoris anisocpilus, Walk. Cat. Het. i. p. 9 (1867).

Walker's type is a small specimen of the above species appertaining to the variety *affinis*, Westw.

Pæcilocoris plenisignatus, Walk. Cat. Het. i. p. 9. n. 13 (1867).

The specimen on which this species was founded is no
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longer in its place in the British Museum. It is possible that Walker may have discovered an error and relegated the "species" to some other and more proper place. At all events, it must be considered as non-existent and has to be erased from our nomenclature.

Pæcilocoris purpurascens, Westw. in Hope Cat. i. p. 14 (1837).

Abundantly distinct from *P. interruptus*, Westw. (*loc. cit.* p. 14), and is not a synonym of that species as enumerated in the 'Cat. Gén. des Hémiptères' of Lethierry and Severin (p. 20).

Genus CHÆROCORIS.

Chærocoris paganus.

Cimex paganus, Fabr. Syst. Ent. p. 698 (1775)

Attached to a specimen in the National Collection received from the Wilson-Saunders collection, and localized New South Wales, is the following note:—"This species is fossorial in soft sandstone. All this lot were taken in such a state, and the remains of the pupæ were in the holes."

Chærocoris similis, sp. n.

In markings above almost exactly similar to *C. variegatus*, Dall., but the ground-colour is stramineous and not bright red. Beneath stramineous; head and sternum with sub-marginal black lines; abdomen with a single marginal row of angulated black spots. Legs stramineous, streaked with black.

The body is very much narrower and more elongate than in *C. variegatus*, and the rostrum extends almost halfway across the basal segment of the abdomen, while in Dallas's species it about only reaches its base.

Long. 10 millim.

Hab. Australia, Adelaide. Type, Brit. Mus.

Genus TETRARTHRIA.

Tetrarthria variegata.

Tetrarthria variegata, Dall. List Hem. Ins. i. p. 20, pl. i. fig. 1 (1851).

Var. *Tetrarthria lateralis*, Walk. Cat. Het. i. p. 21 (1867).

Var. *Tetrarthria congrua*, Walk. *loc. cit.* p. 20.

This is a most variable species, and it is more than probable that some of those enumerated below as species are also

but forms of *T. variegata*. More material, however, seems necessary before further union is attempted.

Tetrarthria varia.

Tetrarthria varia, Walk. Cat. Het. i. p. 18 (1867)

Var. *Tetrarthria lineata*, Walk. loc. cit. p. 18.

Tetrarthria maculata.

Tetrarthria maculata, Walk. Cat. Het. i. p. 22 (1867).

Tetrarthria basalis, Walk. loc. cit. p. 23.

Genus BRACHYAULAX.

Brachyaulax oblonga.

Tectocoris oblonga, Westw. in Hope Cat. i. p. 14 (1837).

Scutellera cyaneovittata, Walk. Cat. Het. i. p. 16 (1867).

Scutellera maculigera, Walk. loc. cit. p. 16.

Scutellera pubescens, Walk. loc. cit. iii. p. 507 (1868).

Var. *Scutellera buprestoides*, Walk. loc. cit. i. p. 16 (1867).

Genus PHILIA.

Philia femorata.

Callidea femorata, Walk. Cat. Het. i. p. 38. n. 49 (1867).

Callidea curtula, Walk. loc. cit. p. 39. n. 54.

Callidea collaris, Walk. loc. cit. p. 40. n. 56.

Var. *Callidea aureocincta*, Walk. loc. cit. p. 41. n. 58.

These may all subsequently prove to be varieties of *P. senator*, Fabr., but they are distinct from that species in coloration; and whereas the typical *P. senator* appears to be almost confined to Australia, *P. femorata* and its variety are dominant in the eastern portion of the Malay Archipelago, though specimens have been received from Somerset, Cape York Peninsula.

Philia subapicalis.

Callidea subapicalis, Walk. Cat. Het. i. p. 36. n. 45 (1867).

A species of considerably larger size than *P. femorata*, to which in other respects it is very closely related, and altogether distinct from *C. munda* and *C. spilogastra*, to which Walker allies it. The basal two of the five golden-green spots to the scutellum described by Walker are very indistinct. Possibly another large form of *P. senator*.

Philia ditissima.

Callidea ditissima, Vollenhoven, Faun. Ind. Neerl. i. p. 26, pl. ii. fig. 5 (1863).

Callidea cræsus, Vollenhoven, Tijdschr. v. Entom. xii. p. 250, pl. xi. fig. e (1869).

Callidea flammigera, Walk. Cat. Het. i. p. 42. n. 59 (1867); var. *loc. cit.* iii. p. 512 (1868).

Philia fastuosa.

Callidea fastuosa, Vollenhoven, Faun. Ind. Neerl. i. p. 26 (1863).

Callidea fulgida, Walk. Cat. Het. i. p. 36. n. 46 (1867).

Callidea solita, Walk. *loc. cit.* p. 36. n. 47.

Callidea discoidalis, Walk. *loc. cit.* p. 41. n. 57.

Stål (En. Hem. iii. p. 15), comparing this species with *P. ditissima*, remarks:—"Limbus flavescens ventris angustior quam in speciebus præcedentibus." The margin to the abdomen is, however, variable, being as wide as in *ditissima* in the specimens Walker described under the name of *C. solita*, and narrowing in other specimens till the margin is practically obsolete.

Philia jactator.

Callidea jactator, Stål, Oefv. Vet.-Ak. Förh. 1854, p. 231; *loc. cit.* 1856, p. 52. 2.

Callidea gloriosa, Vollenh. Faun. Ind. Neerl. i. p. 35. n. 32, pl. iii. fig. 5 (1863).

Callidea munda, Walk. Cat. Het. i. p. 37. n. 48 (1867).

Callidea sulaca, Walk. *loc. cit.* p. 42. n. 60.

Philia balteata.

Callidea balteata, Walk. Cat. Het. i. p. 34. n. 40 (1867).

Callidea latefasciata, Vollenh. Versl. Ak. Amst. (2) ii. p. 175 (1868); Tijdschr. v. Ent. xii. p. 257, pl. xi. fig. d (1869).

Walker's type was from New Guinea.

Philia distinguenda.

Callidea distinguenda, Walk. Cat. Het. iii. p. 514 (1868).

Philia erythrina.

Callidea erythrina, Walk. Cat. Het. i. p. 44. n. 64 (1867).

Philia leucocyanea, Montrouzier, Ann. Sc. Phys. Nat. d'Agric. sér. 2, vii. 1, p. 95 (1855).

This species appears to be of a variable nature, judging from some Solomon-Islands specimens in the British Museum.

- Var. *a* (typical).—Duke of York's Island (*coll. Dist.*).
 Var. *b*.—Pronotum wholly black, excepting lateral areas. Solomon Islands.
 Var. *c*.—As in var. *a*, but with the legs wholly cyaneous. Solomon Islands.
 Var. *d*.—Wholly purplish black above, but with the posterior lateral marginal ochraceous coloration to the pronotum. Femora ochraceous, with their apices cyaneous. Solomon Islands.
 Var. *e*.—Wholly purplish black above. Femora ochraceous, their apices concolorous. New Britain.

Philia Woodfordi, sp. n.

Bright metallic bronzy green; head, lateral margins of pronotum, and basal half of scutellum emerald-green; central lobe and basal margin of head, anterior marginal area of pronotum, basal callosity, and two large fused spots on apical area of scutellum purplish black; extreme apex of scutellum bronzy green. Body beneath emerald-green; areas of the odoriferous apertures and basal margins of the abdominal segments black. Coxæ, trochanters and femora, and lateral margins of the abdomen ochraceous. Antennæ piceous, first and second joints ochraceous; rostrum piceous, basal joint ochraceous.

Pronotum and scutellum coarsely punctate; abdomen beneath finely wrinkled and sparingly punctate, its ochraceous lateral margin entire.

Long. 11–12 millim.

Hab. Solomon Islands (*Woodford*; Brit. Mus.).

Genus CALLIPHARA.

Calliphara prasinia, Guér. (*Scutellera*), Voy. Coq., Ins. pp. 158 & 160, pl. xi. fig. 3 (1830).

Tetrarthria sobria, Walk. Cat. Het. i. p. 21. n. 10 (1867).

Tetrarthria nigra, Walk. *loc. cit.* p. 23. n. 16

Callidea ebenina, Walk. *loc. cit.* p. 39. n. 52

Calliphara bifasciata.

Callidea (*Calliphara*) *bifasciata*, White, Trans. Ent. Soc. Lond. iii p. 85 (1843).

Callidea quadrifera, Walker, Cat. Het. iii. p. 514 (1868)

Calliphara excellens.

Tetyra excellens, Burm. Nov. Act. Acad. Leop. xvi., Suppl. i. p. 287, pl. xli. fig. 2 (1834).

Tectocoris obscura, Westw. in Hope Cat. i. p. 11 (1837).

Calliphara regalis.

Cimeæ regalis, Fabr. Syst. Ent. p. 697 (1775).

Callidea erythropsila, Walk. Cat. Het. i. p. 33. n. 38 (1867).

Callidea semirufa, Walk. loc. cit. p. 34. n. 39.

Callidea biptaga, Walk. loc. cit. p. 35. n. 42.

Calliphara quadrinotata.

Callidea quadrinotata, Walk. Cat. Het. i. p. 38. n. 51 (1867).

Var. *a* (typical).—Pronotum purplish; scutellum luteous, with four purplish spots.

Var. *b*.—Pronotum purplish red, with dark bluish spots; scutellum purplish red, with four bluish spots, and the apex also of the same colour. New Guinea (Brit. Mus.).

Var. *c*.—Pronotum resplendent green, with bluish-black spots; scutellum with seven blackish spots. Admiralty Islands (Brit. Mus.).

Allied to *C. eximia*, Vollenh.

Calliphara flagrans.

Tetrarthria flagrans, Walk. Cat. Het. i. p. 24. n. 19 (1867)

Genus CHRYSOCORIS.

Chrysocoris atricapillus.

Scutellera atricapilla, Guérin, Voy. Coq., Ins. p. 156 (1830).

Poecilocoris melanocephalus, Walk. Cat. Het. i. p. 10. n. 16 (1867).

Var. *Callidea variabilis*, Vollenh. Faun. Ind. Neerl. i. p. 22, pl. i. fig. 9 (1863).

Callidea ampla, Walk. Cat. Het. i. p. 35. n. 44 (1867).

Chrysocoris coxalis.

Callidea coxalis, Stål, Ann. Soc. Ent. Fr. (4) iv. p. 47 (1864).

Callidea tessellata, Walk. Cat. Het. i. p. 38. n. 50 (1867).

Callidea proxima, Walk. loc. cit. p. 39. n. 53.

Chrysocoris spilogastra.

Callidea spilogastra, Walk. Cat. Het. i. p. 30. n. 22 (1867).

*Chrysocoris Stollii.**Cimer Stollii*, Wolff, Ic. ii. p. 48, fig. 45 (1801).*Callidea porphyricola*, Walk. Cat. Het. i. p. 29. n. 19 (1867).*Chrysocoris peltophoroides.**Tetrarthria peltophoroides*, Walk. Cat. Het. i. p. 22. n. 13 (1867).*Callidea celchensis*, Vollenh. Versl. Ak. Amst. (2) ii. p. 175 (1868);

Tijdschr. voor Ent. xii. p. 258, pl. xi. fig. c (1869).

*Chrysocoris Germari.**Scutellera Germari*, Eschsch. Entomogr. i. p. 100. 73, pl. ii. fig. 2 (1822).Var. *Callidea consul*, Vollenh. Faun. Ind. Neerl. i. p. 36. n. 1 (1863).*Callidea jucunda*, Walk. Cat. Het. i. p. 44. n. 66 (1867).*Chrysocoris melanophora.**Callidea melanophora*, Walk. Cat. Het. iii. p. 513 (1868).*Callidea sodalis*, Walk. loc. cit. p. 513.*Chrysocoris purpureus.**Callidea purpurea*, Westw. in Hope Cat. i. p. 15 (1837).*Chrysocoris viridis*, Atkins, Notes Ind. Rhynch. Heter. ii. p. 175 (1887).*Chrysocoris partita.**Callidea partita*, Walk. Cat. Het. i. p. 40. n. 55 (1867).Var. *Callidea galerucoides*, Walk. loc. cit. p. 43. n. 61.

Genus LAMPROCORIS.

*Lamprocoris lateralis.**Scutellera lateralis*, Guér. Voy. Coq., Ins. pp. 159, 160 (1830).*Callidea contraria*, Walk. Cat. Het. i. p. 30. n. 21 (1867).*Lamprocoris Roylii.**Callidea Roylii*, Westw. in Hope Cat. i. p. 16 (1837).*Callidea histeroidea*, Walk. Cat. Het. i. p. 28. n. 16 (1867).*Callidea scripta*, Walk. loc. cit. p. 29. n. 17.*Callidea gibbula*, Walk. loc. cit. p. 29. n. 18.

Genus CRYPTACRUS.

*Cryptacrus rufopicta.**Callidea rufopicta*, Walk. Cat. Het. i. p. 26. n. 2 (1867).

Genus GRAPTOCORIS.

Graptocoris aulicus.*Pachycoris aulicus*, Germ. in Silbern. Rev. v. p. 189 (1837).Var. *Chærocoris personatus*, Stål, Cefv. Vet.-Ak. Forh. 1853, p. 210.*Cryptacrus signifer*, Walk. Cat. Het. i. p. 11. n. 3 (1867).*Graptocoris grandis*, sp. n.

Orange-yellow; head, antennæ, two very large discal spots to pronotum (extending from base to near anterior margin, only slightly separated and nearly occupying the whole of disk), scutellum with two small spots near base, two large and fused transverse spots at centre, and two similar spots before apex, costal margin of corium and apex of membrane, sternum (excluding lateral margins of prosternum and base of metasternum), large central and marginal spots to abdomen, and the legs bluish black.

Body broad, somewhat transversely flattened, sparingly and finely punctate.

Long. 17 millim.; exp. pronot. angl. 11 millim.

Hab. Central Africa: Yambuya, River Aruwimi (*Stanley Expedition*). *Coll. Dist.*

Genus CALLIDEA.

Callidea purpurascens.*Libysa purpurascens*, Walk. Cat. Het. iii. p. 509 (1868).*Libysa Westwoodi*, Vollenh. Versl. Ak. Amst. Nat. (2) ii. p. 175 (1868).

Genus CALLISCYTA.

Calliscyta australis, sp. n.

Head dark indigo-blue, apices of the lateral lobes reddish; eyes ochraceous. Pronotum castaneous, with dark indigo shadings and with a central longitudinal irregular yellowish fascia. Scutellum castaneous, dark and shaded with blue on basal area, paler and ochraceous at apical area; a short oblique curved yellow fascia at each basal angle and two rounded blackish spots before apex. Head beneath and sternum dark indigo-blue; legs castaneous; coxæ and trochanters ochraceous. Abdomen sanguineous, with a lateral series of transverse stigmatal spots and a large subapical spot bluish black.

Head finely punctate; pronotum and basal two thirds

of scutellum coarsely punctate. Antennæ and rostrum mutilated

Long. 13 millim.

Hab. Queensland. (Type, Brit. Mus.)

Genus MACRAULAX.

This genus, which Dallas founded on two Australian specimens which he identified, and as I can only consider correctly, as the *Pachycoris bipunctatus*, H.-Schäff., is now generally sunk as a synonym of the genus *Tetyra*, and Herr.-Schäffer's name applied to a Central and North-American species. I have searched the record-book of the British Museum, and no doubt seems to exist that Dallas's specimens came from Australia and formed part of "Harrington's collection." On the other hand, these specimens agree with Stål's description of Texan and Mexican species he examined, viz.:—"Rostro paullo pone medium ventris extenso; ventre ultra medium sulcato." It is, however, more than unlikely that the same species is found in both Central America and Australia, and nowhere else.

Genus PACHYCORIS.

Pachycoris chrysomelinus.

Pachycoris chrysomelinus, Walk Cat Het 1 p 52. n 88 (1867).

Genus POLYTES.

Polytes propinquus.

Pachycoris propinquus, Walk Cat Het 1 p 50. n. 30 (1867)

Polytes inca, sp. n.

Ochraceous; head with four longitudinal black fasciæ, two central and a short one on the inner side of each eye; pronotum with three double series of black spots, between which series are some smaller black spots arranged in linear manner, some similar spots near lateral margin; scutellum with irregular black markings, consisting principally of three large basal spots and a waved transverse fascia across disk, the remaining area with small spots and streaks of the same colour. Margins of corium spotted with black. Body beneath and legs pale ochraceous; head with a lateral streak in front of each eye, some marginal spots to prosternum, femoral and tibial streaks, tarsi, apex of rostrum, and a sublateral series of stigmal spots to abdomen black. Antennæ with

the three basal joints black, first ochraceous at base, remaining joints mutilated. Rostrum reaching the third abdominal segment.

Long. 10 millim.; lat. 7 millim.

Hab. Peru (*coll. Dist.*).

Polytes granulatus.

Symphylus granulatus, Walk. Cat. Het. iii. p. 516 (1868)

I place this species in the genus *Polytes*, though Stål's diagnosis of that genus is very obscure. In his original description (Cefv. Vet.-Ak. Förh. 1867, p. 492) he gives the type ("*Pachycoris hebraicus*, P. B., ad hoc genus est referendus"). But in his subsequent 'Enumeratio Hemipterorum,' i. p. 10, he places *hebraicus* in the genus *Diolcus*, Mayr. Both genera stand in his 'Enumeratio,' and no further explanation is given.

Genus ASCANIUS.

Ascanius cassidoides.

Pachycoris cassidoides, Walk. Cat. Het. i. p. 48 n. 16 (1867).

Genus ACHATES.

Achates trinotatus.

Pachycoris trinotatus, Walk. Cat. Het. i. p. 51. n. 35 (1867).

Achates ramosus, Dist. Biol. Centr.-Am., Rhynch.-Het. Suppl. p. 311, pl. xxx. fig. 4 (1889).

Achates vittatus.

Symphylus vittatus, Walk. Cat. Het. i. p. 55. n. 10 (1867)

Achates leucotelus.

Pachycoris leucotelus, Walk. Cat. Het. i. p. 52. n. 36 (1867).

Achates neotropicalis, sp. n.

Ochraceous, spotted and striped with castaneous.

Head sparingly and coarsely punctate; two castaneous spots at base; eyes castaneous, apical half of central lobe and the antennæ black. Pronotum coarsely and sparingly punctate, with the lateral angles and five central fasciæ castaneous, of which the outermost on each side is bent and does not reach the anterior margin. Scutellum coarsely and sparingly punctate, with two central longitudinal fasciæ, on each of which is a broken fascia consisting of three spots and

a basal sublateral fascia castaneous. Body beneath and legs pale ochraceous; abdomen dark castaneous, its disk pitchy, its lateral and apical margins ochraceous. Rostrum reaching the posterior coxæ.

Long. 7 millim.

Hab. Amazons, Madeira River (*coll. Dist.*).

Genus ORSILOCHUS.

Orsilochus divergens.

Symphylus divergens, Walk. Cat. Het. iii. p. 516 (1868).

Genus DIOLCUS.

Diolcus Boscii.

Cimex Boscii, Fabr. Ent. Syst., Suppl. p. 529. 27, 28 (1798)

Symphylus politus, Walk. Cat. Het. iii. p. 518 (1868).

Walker's type is in a mutilated condition, wanting the abdomen. It seems, however, to pertain to the Fabrician species.

Genus DYSTUS.

Dystus scitulus.

Agonosoma scitula, Walk. Cat. Het. i. p. 60. n. 9 (1867).

Genus AGONOSOMA.

Agonosoma trilineata.

Cimex trilineatus, Fabr. Spec. Ins. ii. p. 341 (1781).

Agonosoma flavolineata, Uhler (nec Lap.), Proc. Zool. Soc. 1894, p. 169.

The specimens identified by Mr. Uhler as *A. flavolineata*, and which are now in the collection of the British Museum, are typical *A. trilineata*, Fabr. No specimens of Laporte's species were in any of the Antillean collections worked by Mr. Uhler. The two specimens described as *A. trilineata*, var. (*loc. cit.* p. 170), are the varietal form *quadriguttata*, Sign.

Genus LOBOTHYREUS.

Lobothyreus lobatus.

Pachycoris lobata, Westw. in Hope Cat. i. p. 12 (1837).

Pachycoris apicalis, Walk. Cat. Het. i. p. 50. n. 32 (1867).

Symphylus signatus, Walk. *loc. cit.* iii. p. 517 (1868).

Genus SPHYROCORIS.

*Sphyrocoris obliquus.**Pachycoris obliquus*, Germar, Zeitschr. i. p. 94 (1839).*Pachycoris delineatus*, Walk. Cat. Het. i. p. 48. n. 17 (1867).

Genus SYMPHYLUS.

*Symphylus deplanatus.**Pachycoris deplanatus*, Herr.-Schäff. Wanz. iv. p. 3, fig. 344 (1839).*Symphylus apicifer*, Walk. Cat. Het. iii. p. 516 (1868).*Symphylus bipustulatus*, Walk. loc. cit. p. 517.*Symphylus rivulosus.**Pachycoris rivulosus*, Walk. Cat. Het. i. p. 51. n. 34 (1867).*Symphylus plagiatus*, Walk. loc. cit. p. 55. n. 11.*Symphylus cyphnoides.**Pachycoris cyphnoides*, Walk. Cat. Het. i. p. 50. n. 31 (1867).*Symphylus vernus*, Dist. Biol. Centr.-Am., Rhynch.-Het. Suppl. p. 815, pl. xxix. fig. 25 (1889).*Symphylus leucospilus.**Pachycoris leucospilus*, Walk. Cat. Het. i. p. 51. n. 33 (1867).*Symphylus obtusus.**Symphylus obtusus*, Dall. List Hem. i. p. 37 (1851).*Symphylus gibbosus*, Dist. Biol. Centr.-Amer., Rhynch.-Het. p. 23, pl. iii. fig. 2 (1880).

Although I carefully compared the Mexican specimen belonging to Dr. Signoret with the single type specimen of Dallas from Colombia before describing it as a new species, another specimen has been received from Panama, and although the size of the specimens differ and, by implication, also the shape, I think they are better united as one species.

*Symphylus divergens.**Symphylus divergens*, Walk. Cat. Het. iii. p. 517 (1868).

The single type specimen is in very bad condition, but seemingly appertains to the genus *Symphylus*.

Note.—Walker described two different species under the above name on consecutive pages of his list. The first (p. 516) is an *Orsilochus*, the second (*supra*) is apparently a *Symphylus*.

Genus *TESTRINA*.

Testrina, Walk. Cat. Het. i. p. 61 (1867).

This genus may be placed near *Galeacius*, Dist.

Testrina laticollis.

Testrina laticollis, Walk. Cat. Het. i. p. 61 (1867).

Genus *CAMIRUS*.

Camirus conicus.

Pachycoris conicus, Germ. Zeitschr. i. p. 106 (1839).

Symphylus oculatus, Walk. Cat. Het. iii. p. 519 (1868).

Camirus brevilineus.

Bolbocoris brevilineus, Walk. Cat. Het. i. p. 63. n. 8 (1867).

Genus *HOTEA*.

Hotea subfasciata.

Trigonosoma subfasciatum, Westw. in Hope Cat. i. p. 11 (1837).

Hotea melanaria, Walk. Cat. Het. i. p. 56. n. 3 (1867).

Hotea nigrorufa.

Hotea nigrorufa, Walk. Cat. Het. i. p. 57. n. 6 (1867).

Hotea circumcincta, Walk. Cat. Het. i. p. 57. n. 8 (1867).

The type is no longer contained under this name in the British Museum. It was described as from Penang, where *H. curculionoides*, Herr.-Schäff., is the common species. Walker most probably corrected himself without comment.

Hotea curculionoides.

Pachycoris curculionoides, Herr.-Schäff. Wanz. Ins. iii. p. 106, fig. 331 (1835).

Hotea nasuta, Walk. Cat. Het. i. p. 58. n. 9 (1867).

Genus *DEROPLAX*.

Deroplax diffusa.

Hotea? diffusa, Walk. Cat. Het. i. p. 57. n. 7 (1867).

Genus *PHIMODERA*.

Phimodera torpida.

Phimodera torpida, Walk. Cat. Het. i. p. 75. n. 4 (1867).

Genus EURYGASTER.

Eurygaster sinicus.*Eurygaster sinicus*, Walk. Cat. Het. i p. 67. n. 9 (1867)

Genus MACROCARENUS.

Macrocarenus scutellatus, sp. n.

Dull ochraceous, scutellum narrowly margined with pale luteous. Head faintly rugulose, the central lobe and the outer margins of the lateral lobes a little darker in hue; eyes fuscous; antennæ brownish ochraceous. Pronotum somewhat thickly and finely punctate, basal area shaded with pale fuscous; two large transverse foveate callosities on anterior area; posterior lateral angles subprominent and somewhat nodulose. Scutellum testaceous at base and with a small yellowish spot near each basal angle; the testaceous area is slightly rugulose, basal angles and whole central area coarsely and darkly punctate. Corium sparingly but coarsely and darkly punctate. Connexivum thickly, finely, and darkly punctate, its extreme outer margin pale luteous, the segmental incisures fuscous. Body beneath and legs pale luteous; abdomen and legs speckled with brownish. Rostrum reaching the posterior coxæ.

Long. 6 millim.

Hab. Australia, Peak Downs (*coll. Dist.*).

Less elongate, more convex, and different in coloration to *M. acuminatus*, Dall., the only other at present described species of the genus.

Genus AUGOCORIS.

Augocoris rugulosus.*Augocoris rugulosus*, Herr.-Schaff. Wanz. Ins. iv. p. 92, fig. 432 (1839).*Pachycoris quadristriga*, Walk. Cat. Het. i. p. 52. n. 37 (1867).

Genus MELANODEMA.

Melanodema apicifera, sp. n.

Black; apex of the scutellum with a very distinct irregular, longitudinal, pale ochraceous spot. Pronotum and scutellum with a distinct central, longitudinal, carinate line.

Allied to *M. carbonaria*, Jakowleff, but larger; apical pale spot to scutellum much larger; pronotum less foveate; scutellum much less foveate at basal margin; central carina to pronotum and scutellum distinct.

Long. 9 millim.

Hab. Bombay (*Dr. Leith, coll. Dist.*).

A single specimen contained in Dr. Leith's Indian collection has been in my possession for the last twenty years, and I have refrained from describing it on account of the imperfect condition of the legs and antennæ. As, however, the only other species of the genus is from Turkestan, it seems a pity to still refrain from recording its Oriental congener.

MORBORA, gen. nov.

Allied to *Odontoscelis*, but body more convex; lateral margins of head and pronotum strongly and longly spinous. Head with the eyes sessile, its frontal and apical lateral margins longly spinous; between the eyes and this anterior spinous margin is a distinct lateral peduncle with its extremity spinous; lateral lobe moderately convex and elevated. Pronotum with the lateral margins laminate and longly spinous, acutely truncate before the eyes. Abdomen with the lateral margins shortly spinous; abdomen beneath with an oblique sericeous patch on each side and situate on the third, fourth, and fifth segments. Rostrum reaching the posterior coxæ.

Morbora australis, sp. n.

Brownish ochraceous; head coarsely and darkly punctate, with a central ochraceous fascia more or less margined with black; pronotum with its anterior area somewhat irregularly foveate, its posterior area a little paler and darkly punctate. Scutellum thickly and coarsely punctate. Body beneath and legs brownish ochraceous; abdomen with a dull black sericeous patch on each side of disk; femora with an ochraceous spot beneath a little before apex.

Long. 6 millim.

Hab. Australia, Peak Downs (*coll. Dist.*).

GRAPHOSOMINÆ.

Genus *TRIGONOSOMA*.

Trigonosoma Fischéri.

Trigonosoma Fischéri, Hern.-Schaff. Wanz. Ins. ix. p. 331 (1853).

Trigonosoma Desfontainii, Dall. (nec Fabr.) List Hem. i. p. 40. n. 1 (1851).

Trigonosoma fakata, Walk. (nec Cyrillo) Cat. Het. i. p. 64. n. 1 (1867).

Trigonosoma Fischéri, Walk. *loc. cit.* p. 65. n. 5.

Trigonosoma confusum, Kirby, Journ. Linn. Soc., Zool. vol. xxiv. p. 77 (1891).

Ceylon is certainly a wrong locality for this species.

Genus BOLBOCORIS.

Bolbocoris reticulatus.*Bolbocoris*? *reticulatus*, Dall. List Hem. i. p. 45. n. 2 (1851).*Furygaster incomptus*, Walk. Cat. Het. i. p. 67. n. 10 (1867).

Genus ANCYROSOMA.

Ancyrosoma affine.*Trigonosoma affine*, Westw. in Hope Cat. Hem. i. p. 12 (1837).

Closely allied to *A. albolineata*, Fabr., but with the second longitudinal carina on each half of the scutellum nearly straight, not strongly waved.

Genus PODOPS.

Podops limosa.*Podops limonius*, Walk. Cat. Het. i. p. 72. n. 17 (1867).

Walker appends to his description the remark:—"The colour distinguishes it from *P. niger* (Dall.), with which it agrees in structure." This is totally incorrect, the *P. niger*, Dall., having the lateral margins of the pronotum convexly sinuate and reflexed. In structure *P. limosa* resembles *P. coarctata*, Walk., but can be recognized by some longitudinal series of punctures to the scutellum.

Podops coarctata.*Cymex coarctatus*, Fabr. Ent. Syst. Suppl. p. 530 (1793).*Scotinophara coarctata*, Atkins. Notes Ind. Rhynch. Heter. ii. p. 195 (1887).*Podops spinosus*, Walk. Cat. Het. i. p. 73. n. 18 (1867).*Podops nasalis*, Walk. loc. cit. p. 73. n. 19.*Podops exacta*, Walk. loc. cit. p. 74. n. 24.*Podops spinifera*.*Podops spinifera*, Westw. in Hope, Cat. Hem. i. p. 16 (1837).*Podops funestus*, Walk. Cat. Het. iii. p. 521 (1866).*Podops asper*, Walk. Cat. Het. i. p. 72. n. 10 (1867).

This species is founded on two specimens; the condition of both, however, is so deplorable that at present nothing definite can be said as to specific validity or generic correctness.

Podops conspersus, Walk. Cat. Het. i. p. 71 (1867).

Does not belong to the Graphosominæ at all, and will be located subsequently.

Summarized Disposition of Walker's Genera and Species.

Scutellerinæ and Graphosominæ.

Genera considered valid.

Fitha, Walk. Cat. Het. i. p. 45 (1867).

Testrina, Walk. loc. cit. p. 61

Testrica, Walk. loc. cit. p. 69

Genera treated as synonymic.

Sophela, Walk. Cat. Het. i. p. 17. (1867), = *Lamprocoris*, Stål.

Teressa, Walk. loc. cit. p. 113, = *Brachycerocoris*, Costa.

Species considered valid and described under correct Genera

Culeotichus nigrovarius, Walk. Cat. Het. i. p. 2. n. 5 (1867).

— *discrepans*, Walk. loc. cit. p. 2. n. 7.

— *excellens*, Walk. loc. cit. p. 3. n. 8.

Sphærocoris annulatus, Walk. loc. cit. p. 6. n. 14.

Pæulocoris saturatus, Walk. loc. cit. p. 10. n. 17.

Tetrarthria varia, Walk. loc. cit. p. 18. n. 1.

— *flexuosa*, Walk. loc. cit. p. 21. n. 12.

— *maculata*, Walk. loc. cit. p. 22. n. 14.

— *amæna*, Walk. loc. cit. iii. p. 508 (1868).

Fitha ardens, Walk. loc. cit. i. p. 45. n. 1 (1867).

Pachycoris chrysomelinus, Walk. loc. cit. p. 52. n. 38.

Symphylus divergens, Walk. loc. cit. iii. p. 517 (1868).

— *ramivitta*, Walk. loc. cit. p. 518.

Hotea nigrorufa, Walk. loc. cit. i. p. 57. n. 3 (1867).

Testrina laticollis, Walk. loc. cit. p. 61.

Eurygaster sinicus, Walk. loc. cit. p. 67. n. 9.

Testrica antica, Walk. loc. cit. p. 70.

Phimodera torpida, Walk. loc. cit. p. 75. n. 4.

Species considered valid, but requiring generic revision.

Sphærocoris cyaneosparus, Walk. Cat. Het. i. p. 6. n. 17 (1867), belongs to gen. *Hyperoncus*.

— *circuliferus*, Walk. loc. cit. p. 7. n. 18, belongs to gen. *Dameliu*, gen. nov.

Tetrarthria fasciata, Walk. loc. cit. p. 20. n. 9, belongs to gen. *Calliphara*.

— *peltophoroides*, Walk. loc. cit. p. 22. n. 13, " *Chrysocoris*.

— *flagrans*, Walk. loc. cit. p. 24. n. 19, belongs to gen. *Calliphara*.

Libyssa purpurascens, Walk. loc. cit. iii. p. 509 (1868), belongs to gen. *Callidea*.

Callidea rufopicta, Walk. loc. cit. i. p. 26. n. 2 (1867), belongs to gen. *Cryptacrus*.

— *epilogastræ*, Walk. loc. cit. p. 30. n. 22, belongs to gen. *Chrysocoris*.

— *balteata*, Walk. loc. cit. p. 34. n. 40, belongs to gen. *Phila*.

— *nubipicalis*, Walk. loc. cit. p. 36. n. 45, " "

— *femorata*, Walk. loc. cit. p. 38. n. 49, " "

- Callidea quadrinotata*, Walk. loc. cit. p. 38. n. 51, belongs to gen. *Calliphura*.
 — *partita*, Walk. loc. cit. p. 40. n. 55, belongs to gen. *Chrysocoris*.
 — *erythrina*, Walk. loc. cit. p. 44. n. 64, " *Philia*.
 — *melanophora*, Walk. loc. cit. iii. p. 513 (1868), belongs to gen. *Chrysocoris*.
 — *distinguenda*, Walk. loc. cit. p. 514, belongs to gen. *Philia*.
Pachycoris cassidoides, Walk. loc. cit. i. p. 48. n. 16 (1867), belongs to gen. *Ascanius*.
 — *propinquus*, Walk. loc. cit. p. 50. n. 30, belongs to gen. *Polytes*.
 — *cyphonoides*, Walk. loc. cit. p. 50. n. 31, " *Symphylus*.
 — *leucospilus*, Walk. loc. cit. p. 51. n. 33, " "
 — *rufulosus*, Walk. loc. cit. p. 51. n. 34, " "
 — *trinitatus*, Walk. loc. cit. p. 51. n. 35, " *Achates*.
 — *leucotelus*, Walk. loc. cit. p. 52. n. 36, " "
Symphylus vittatus, Walk. loc. cit. p. 55. n. 10, " "
 — *granulatus*, Walk. loc. cit. iii. p. 516 (1868), belongs to gen. *Polytes*.
 — *divergens*, Walk. loc. cit. p. 516 (nec p. 517), " *Orsilochus*.
Hotea ? *diffusa*, Walk. loc. cit. i. p. 57. n. 7 (1868), " *Dero-plax*.
Agonosoma scitula, Walk. loc. cit. p. 60. n. 9, belongs to gen. *Dytus*.
Bolbocoris brevilinea, Walk. loc. cit. p. 63. n. 8, " *Cumirus*.

Species treated as synonymic

- Coleotichus sordidus*, Walk. Cat. Het. i. p. 1. n. 4 (1867), = *C. fuscus*, Vollenh.
 — *testaceus*, Walk. loc. cit. p. 2. n. 6, = *C. artensis*, Montr.
Parcilicoris anisospilus, Walk. loc. cit. p. 9. n. 11, = *P. Hardwickei*, Westw.
 — *melanocephalus*, Walk. loc. cit. p. 10. n. 13, = *Chrysocoris atricapillus*, Guér.
Cryptacrus signifer, Walk. loc. cit. p. 11. n. 3, = *Graptocoris aulicus*, Germ., var. *personatus*, Stål.
 — *erotylodes*, Walk. loc. cit. p. 11. n. 4, = *Anoplogonius nigricollis*, Sign., var.
 — *niphoides*, Walk. loc. cit. p. 12. n. 5, = *Anoplogonius nigricollis*, Sign., var.
Tectocoris pusillus, Walk. loc. cit. p. 13. n. 3, = *T. lineola*, Fabr.
 — *obliquus*, Walk. loc. cit. p. 13. n. 4, = *T. lineola*, Fabr., near var. *diopthalmus*, Thunb.
Cantao bandanus, Walk. Cat. Hem. Het. i. p. 14. n. 4 (1867), = *C. purpuratus*, Westw.
 — *inscitus*, Walk. loc. cit. iii. p. 506 (1868), = *C. rudis*, Vollenh.
 — *conscitus*, Walk. loc. cit. p. 507, = *C. rudis*, Vollenh.
Scutellera cyaneoritta, Walk. loc. cit. i. p. 16. n. 7 (1867), = *Brachyaulax oblonga*, Westw.
 — *buprestoides*, Walk. loc. cit. p. 16. n. 8, = *Brachyaulax oblonga*, Westw., var.
 — *maculigera*, Walk. loc. cit. p. 16. n. 9, = *Brachyaulax oblonga*, Westw.
 — *pubescens*, Walk. loc. cit. iii. p. 507 (1868), = *Brachyaulax oblonga*, Westw.
Tetrarthria lineata, Walk. loc. cit. i. p. 18. n. 2 (1867), = *T. variegata*, Dall., var.
 — *tetraspila*, Walk. loc. cit. p. 19. n. 3, = *Chrysocoris grandis*, Thunb.
 — *congrua*, Walk. loc. cit. p. 20. n. 7, = *T. variegata*, Dall., var.

- Tetrarthria rutila*, Walk. loc. cit. p. 20. n. 8, = *Chrysocoris quadri-maculatus*, Vollenh., var. *Schlegelii*, Vollenh.
- *sobria*, Walk. loc. cit. p. 21. n. 10, = *Calliphara prasinia*, Guér.
- *lateralis*, Walk. loc. cit. p. 21. n. 11, = *T. variegata*, Dall., var.
- *cleroides*, Walk. loc. cit. p. 23. n. 15, = *Chrysocoris quadrimaculatus*, Vollenh.
- *nigra*, Walk. loc. cit. p. 23. n. 16, = *Calliphara prasinia*, Guér.
- *basalis*, Walk. loc. cit. p. 23. n. 17, = *T. maculata*, Walk.
- *mesozona*, Walk. loc. cit. p. 24. n. 18, = *Chrysocoris sellatus*, White.
- Callidea histeroides*, Walk. loc. cit. p. 25. n. 16, = *Lamprocoris Roylii*, Westw.
- *scripta*, Walk. loc. cit. p. 29. n. 17, = *Lamprocoris Roylii*, Westw.
- *gibbula*, Walk. loc. cit. p. 29. n. 18, = *Lamprocoris Roylii*, Westw.
- *porphyricola*, Walk. loc. cit. p. 29. n. 19, = *Chrysocoris Stollii*, Wolff.
- *contraria*, Walk. loc. cit. p. 30. n. 21, = *Lamprocoris lateralis*, Guér.
- *erythrospila*, Walk. loc. cit. p. 33. n. 38, = *Calliphara regalis*, Fabr.
- *semirufa*, Walk. loc. cit. p. 34. n. 39, = *Calliphara regalis*, Fabr.
- *binotata*, Walk. loc. cit. p. 34. n. 41, = *Chrysocoris sellatus*, White, var. *chromatica*, White.
- *biplaga*, Walk. loc. cit. p. 35. n. 42, = *Calliphara regalis*, Fabr.
- *laticincta*, Walk. loc. cit. p. 35. n. 43, = *Calliphara dimidiata*, Dall.
- *ampla*, Walk. loc. cit. p. 35. n. 44, = *Chrysocoris atricapillus*, Guér., var. *variabilis*, Vollenh.
- *fulgida*, Walk. loc. cit. p. 36. n. 46, = *Philia fastuosa*, Vollenh.
- *solita*, Walk. loc. cit. p. 36. n. 47, = *Philia fastuosa*, Vollenh.
- *munda*, Walk. loc. cit. p. 37. n. 48, = *Philia jactator*, Stål.
- *lanceolata*, Walk. loc. cit. p. 38. n. 50, = *Chrysocoris coxalis*, Stål.
- *ebenina*, Walk. loc. cit. p. 39. n. 52, = *Calliphara prasinia*, Guér., var.
- *proxima*, Walk. loc. cit. p. 39. n. 53, = *Chrysocoris coralii*, Stål.
- *curtula*, Walk. loc. cit. p. 39. n. 54, = *Philia femorata*, Walk.
- *collaris*, Walk. loc. cit. p. 40. n. 56, = *Philia femorata*, Walk.
- *discoidalis*, Walk. loc. cit. p. 41. n. 57, = *Philia fastuosa*, Vollenh.
- *flammigera*, Walk. loc. cit. p. 42. n. 59, = *Philia ditissima*, Vollenh.
- *eulaca*, Walk. loc. cit. p. 42. n. 60, = *Philia jactator*, Stål.
- *galerucoides*, Walk. loc. cit. p. 43. n. 61, = *Chrysocoris partita*, Walk., var.
- *jucunda*, Walk. loc. cit. p. 44. n. 60, = *Chrysocoris Germari*, Erichs., var. *consul*, Vollenh.
- *sodalis*, Walk. loc. cit. iii. p. 513 (1868), = *Chrysocoris melanophora*, Walk.
- *quadrifera*, Walk. loc. cit. p. 514, = *Calliphara bifasciata*, White.
- Pachycoris guttipes*, Walk. loc. cit. i. p. 47. n. 11 (1867), = *Tetyra fæcata*, Germ.
- *delinectus*, Walk. loc. cit. p. 48. n. 17, = *Sphyrocoris obliquus*, Germ.
- *apicalis*, Walk. loc. cit. p. 50. n. 32, = *Lobothyreus lobatus*, Westw.
- *quadristriga*, Walk. loc. cit. p. 52. n. 37, = *Augocoris rugulosus*, H.-S.
- Symphylus plagiatus*, Walk. loc. cit. p. 55. n. 11, = *S. rivulosus*, Walk.
- *apicifer*, Walk. loc. cit. iii. p. 516 (1868), = *S. deplanatus*, H.-S.
- *bipustulatus*, Walk. loc. cit. p. 517, = *S. deplanatus*, H.-S.
- *signatus*, Walk. loc. cit. p. 517, = *Lobothyreus lobatus*, Westw.
- *pokitus*, Walk. loc. cit. p. 518, = *Diolus Bosoni*, Fabr.
- *oculatus*, Walk. loc. cit. p. 519, = *Camirus concius*, Germ.
- Hotea mehmaria*, Walk. loc. cit. i. p. 56. n. 3 (1867), = *H. subfasciata*, Westw.

- Hotesa picea*, Walk. loc. cit. p. 50. n. 4, = *Deroplax circumducta*, Germ.
 — *nasuta*, Walk. loc. cit. p. 58. n. 9, = *H. curculionoides*, H.-S.
Euryaster incomptus, Walk. loc. cit. p. 67. n. 10, = *Bolbocoris reticulatus*,
 Dall.
Podops conspersus, Walk. loc. cit. p. 71. n. 9. Not belonging to either of
 the subfamilies here treated.
 — *asper*, Walk. loc. cit. p. 72. n. 10. Condition too bad for identifica-
 tion.
 — *spinosus*, Walk. loc. cit. p. 73. n. 18, = *P. coarctata*, Fabr.
 — *nasalis*, Walk. loc. cit. p. 73. n. 19, = *P. coarctata*, Fabr.
 — *exactus*, Walk. loc. cit. p. 74. n. 24, = *P. coarctata*, Fabr.
 — *funestus*, Walk. loc. cit. iii. p. 521 (1808), = *P. spinifera*, Westw.
Teressa terranea, Walk. loc. cit. i. p. 113. n. 1 (1867), = *Brachycerocorus*
camelus, Costa.

To be treated as non-existent.

*Species the types of which are not now to be found in the
 British Museum.*

- Pecilocoris plenisignatus*, Walk. Cat. Het. i. p. 9. n. 13 (1867).
Tectocoris amboinensis, Walk. loc. cit. p. 14. n. 5.
Scutellera humeralis, Walk. loc. cit. p. 17. n. 10.
Hotesa circumcincta, Walk. loc. cit. p. 57. n. 8.
Podops terricolor, Walk. loc. cit. p. 71. n. 8.

Species the types of which are supposed to be in Australia.

- Bolbocoris mimicus*, Walk. Cat. Het. i. p. 63. n. 6 (1867). National
 Museum, Melbourne.
 — *subpunctatus*, Walk. loc. cit. p. 63. n. 7. National Museum, Mel-
 bourne.
Podops teter, Walk. loc. cit. p. 74. n. 23. National Museum, Melbourne.
Spharocoris subnotatus, Walk. loc. cit. iii. p. 505 (1868). National Mu-
 seum, Melbourne.

III.—*Description of a new Genus and some new Species of
 Fossorial Hymenoptera from the Oriental Zoological Region.*
 By P. CAMERON.

Sapygidae.

This family may now be added to the fauna of the Oriental
 zoological region. It is of small extent. The few species
 known hitherto are from Europe and North America.

Polochrum flavicollis, sp. n.

Nigrum, flavo-maculatum; pedibus nigris, femoribus supra flavo-
 maculatis; alis fere hyalinis, apice fumatis.

Long. 12 mm. ♀.

Antennæ black, the scape and second joint yellow beneath;

the scape covered with long white hair; the flagellum almost bare. Head black, strongly and deeply rugosely punctured and rather thickly covered with white hair; the eye-incision and the lower orbits, a small line on the inner orbits above, the sides of the clypeus, a mark above it triangularly narrowed on the top, and an interrupted line on the middle of the front, fulvous yellow. Pro- and mesothorax rugosely punctured, the median segment more closely and finely punctured; the base of the pronotum, a large oval inner and a smaller outer mark on the sides of the scutellum, a larger more elongate mark opposite the tegulæ, a narrow line on the sides of the postscutellum, and a mark on the mesopleuræ under the fore wings, fulvous yellow. Legs black, thickly covered with white hair; the apex of the fore femora, the apical part of the middle and the greater part of the hinder femora yellow above. Wings hyaline; the radial and the upper part of the cubital cellules to a less extent smoky; the stigma and nervures are black; the first transverse cubital nervure is curved, the others are straight, oblique; the first recurrent is received in the middle, the second in the basal fourth of the cellule. Abdomen shining, smooth; the base of the third and fourth segments and the greater part of the last three segments above lemon-yellow. The pygidium is keeled down the middle, as is also the basal half of the last ventral segment; the basal three ventral segments are incised in the middle, the basal not so distinctly as the other two; in the middle of the second segment is an oval yellow mark; the third has the sides yellow at the base.

I place this species in *Polochrum* rather than in *Sapyga* because the third cubital cellule is not narrowed at the top and because the antennæ are not so distinctly clavate. In the species here described the antennæ are scarcely so long as the thorax and the flagellum is not distinctly narrowed at the base.

Khasia Hills.

Sphegidae.

Sceliphron tibiale, sp. n.

Long. 10-20 mm.

In Bingham's table (Faun. Brit. Ind., Hym. p. 236) this species comes into "A. Colours black and yellow," "a. Mesonotum striate," and "b. Comparatively small (16-18 mm.)," which will be now divided:—

Legs yellow, the apical half of the femora and tibiæ	
black	<i>mach aspatanum.</i>
Legs rufous, the hinder femora above and the hinder	
tibiæ entirely black	<i>tibiale.</i>

Head black, the greater part of the clypeus yellow; the apex of the clypeus and the mandibles ferruginous; the front, vertex, and occiput thickly covered with long pale fulvous hair; the cheeks with golden pubescence; the clypeus sparsely with long fuscous hair. The clypeus at the apex roundly bilobate, bare; the mandibles black at the base and apex; the palpi rufo-testaceous, black at the base. The scape of the antennæ rufous; the flagellum black, the apex of the third joint and the fourth on the underside rufous. Thorax black; a line on the pronotum above, a large transverse mark (rounded and narrowed at the ends), two oblique marks (broad at the base, narrowed towards the apex) on the end of the basal lobe of the median segment, the apex of the segment broadly, the tegulæ, tubercles, a mark under them (narrow and oblique at the top, larger and more triangular below), and a triangular mark under the hind wings yellow. The pronotum is depressed in the middle above; the mesonotum is closely transversely striated, covered with long fuscous hair; the scutellum closely longitudinally striated, most strongly on the sides. Median segment thickly covered with long fuscous hair; the basal part distinctly raised and separated from the apical, broadly furrowed down the middle of the basal part; the apical deeply triangularly depressed at the apex. Propleuræ smooth, deeply excavated in the middle behind; the mesopleuræ and metapleuræ closely and slightly obliquely striated, the latter more strongly towards the apex. Wings fulvo-hyaline, distinctly smoky at the apex; the costa and stigma testaceous, the nervures paler. All the coxæ and trochanters are black; the rest of the legs rufous; the femora broadly black at the base above; the tibiæ black above; the posterior femora black above, the tibiæ entirely black; the basal two joints of the tarsi black at the apex, the other joints entirely black; the calcaria with a thick brush on the basal half. Petiole black, shorter than the rest of the abdomen; the apex of the second segment broadly, of the others more narrowly yellow; the apical almost entirely rufous, smooth above, the sides coarsely punctured.

A distinct species.

Khasia Hills.

CÆNOPSEN, gen. nov.

♀. Comes nearest to *Psen*, with which it agrees in the neurulation of the wings and in the form of the abdomen, but may be readily known from that genus by the second joint of the antennæ (pedicle) being not small, but as long as the third joint; the antennæ themselves are longer, more slender, and not dilated towards the apex, resembling more those of a male than of a female.

Antennæ distinctly longer than the head and thorax united; all the joints elongate; the scape as long as the second joint, slightly curved. Eyes large, reaching near to the base of the mandibles, parallel on the lower half; the ocelli . . . Clypeus roundly convex, its apex transverse and depressed in the middle. Labrum small, rounded. Mandibles? Parapsidal furrows obsolete. Base of median segment depressed, the depression clearly defined, striated, the rest of the segment irregularly reticulated. Tarsi pilose, without spines, the base of the anterior roundly incised; the anterior spur curved, bifid at the apex; the outer spur of the posterior curved, dilated at the base, the inner spur shorter and narrower. Anterior wings with three transverse cubital nervures; the first recurrent nervure is received in the basal fourth of the cellule, the second is interstitial. In the hind wings the transverse anal nervure is received beyond the cubital. Abdomen with a long curved petiole, which is as long as its dilated apex and the second segment united; the apical ventral segments are fringed with stiff hairs, and more particularly the fourth. Pygidial area smooth, keeled laterally.

The head behind the eyes is obliquely narrowed and is there nearly as long as the eyes; the occiput is sharply margined. The antennæ are placed opposite the middle of the eyes; between them is a short distinct keel, narrowed at the top and bottom; the coxæ and trochanters of moderate size; the mesosternum furrowed down the apex; the tubercles are large and are placed distinctly in front of the tegulæ; the eyes have a narrowed but distinct furrow surrounding them; the episternal furrow on the mesopleuræ is distinct, wide, and deep; the pronotum is clearly separated from the mesonotum; the scutellum and postscutellum large, not much raised.

Cænopsen fuscinervis, sp. n.

Niger; capite thoraceque dense pilosis; alis hyalinis, stigmatibusque fuscis. ♀.

Long. 10 mm.

Antennæ stout, twice the length of the thorax, the apical

joints slightly dilated on the lower side, the second joint as long as the third; the scape sparsely covered with white hair; the flagellum bare. Head shining; the face, clypeus, and labrum thickly covered with silvery hair; the front and vertex strongly and closely punctured except near the eyes, and thickly covered with long fuscous hair. Mesonotum strongly and closely punctured; the parapsidal furrows only indicated at the base. The scutellum is not so strongly punctured as the mesonotum; on the outer side of the post-scutellum is a distinct slightly convex keel. In the centre of the basal area of the median segment are two stout straight keels; the rest of it with stout oblique keels; the apex of the segment is almost perpendicular and is furrowed down the middle; in the middle, on either side, are three stout oblique keels, ending at the edge in three small areas. Pro- and mesopleuræ smooth; the tubercles fringed behind by white pubescence; on the base of the mesopleuræ is a wide deep furrow which is bent in the middle; the longitudinal furrow is narrow: the base of the metapleuræ is depressed; on the lower side is a narrow oblique furrow; the apex is irregularly stoutly reticulated; in front of this part are some longitudinal keels. Mesosternum shining, smooth, the central furrow shallow, wide, at the base closely transversely striated. Legs black, covered with longish white hair; the calcaria fulvous. The stigma and nervures are fuscous, the former with a more rufous tint; the first cubital cellule is about one half the length of the third; the first recurrent nervure is received in the basal fourth of the cellule, the second is interstitial. Abdomen smooth and shining; the narrowed part of the petiole longer than its dilated apex and the second segment united, smooth, its sides covered with long white hair; the second ventral segment has a deep furrow at the base, this furrow occupying the entire base, and at the sides is covered with white hair; the apices of the third and fourth ventral segments are fringed with longish hair.

Khasia Hills.

Dolichurus reticulatus, sp. n.

Niger, longe albo-hirsutus; alis hyalinis, stigmatibus fuscis. ♂.
Long. 8 mm.

Antennæ as long as the body, black, the apical joints distinctly narrowed and more or less brownish; the scape covered with black hair; the flagellum bare. Head black except for the apex of the antennal tubercle, which is yellowish white; the vertex is smooth and impunctate; the

front reticulated distinctly and more closely from the middle of the ocellar region; the face and clypeus thickly covered with long white hair and keeled in the middle. Mandibles smooth, testaceous near the apex; the palpi pilose, dark fuscous. Thorax black, thickly covered with long white hair; on either side of the pronotum above is a white tubercle-like mark. Median segment reticulated, the centre with two longish slightly oblique keels, bounded at the apex by a transverse one; the apex of the segment is oblique. Post-scutellum stoutly longitudinally striated. Pro- and mesopleuræ smooth; the metapleuræ obliquely striated. Wings hyaline, iridescent; the nervures are paler than the costa or stigma; the first transverse cubital nervure is obliquely curved above and has, at the angle thus formed, a distinct branch at the base. Abdomen shining, closely but not strongly punctured; the third segment is depressed at the apex and closely transversely striated; the ventral segments are closely punctured, the apex of the third is depressed and striated at the sides.

D. bipunctatus, Bingham, from Burma, comes near to this species, but may be known from it by the head in front being densely punctured, not reticulated. The sides of the mesonotum at the base are raised near to the tegulæ, which are edged with white at the base; the antennal lamina is triangularly depressed in the middle, its apex not quite transverse; the furrow on the centre of the mesosternum is distinct, the lateral one is narrower and indistinct towards the apex. This makes the fourth species of *Dolichurus* known from India.

Khasia Hills.

Ampulex (Rhinopsis) nigricans, sp. n.

Niger, abdominis apice rufo; alis hyalinis, apice fumato. ♀.
Long. 8 mm.

Comes into Bingham's section "B. a¹. Petiole linear at base, nodose at apex," which is now divided:—

Thorax and legs entirely black *nigricans*.
Thorax for the greater part rufous, as are also the legs *constans*.

Thorax and legs entirely black. Antennæ almost bare, perceptibly thickened towards the apex, the third joint more than twice the length of the fourth. Head opaque, sparsely covered with short white pubescence; the vertex coarsely aciculated; the front obscurely reticulated, indistinctly furrowed down the middle. Clypeus aciculated, shining at the

base, convex, the sides with an oblique slope; the apex in the middle ending in a stout triangular tooth. Eyes almost parallel, hardly converging at the top, where they are separated by slightly less than the length of the third antennal joint. Mesonotum aciculated; the furrows deep, moderately wide, and stoutly and closely crenulated throughout; there is another crenulated furrow along the sides. The three central keels on the metanotum reach near to the apex and end in a reticulated space; the central keel is straight; the outer curved, converging towards the apex; the space enclosed by them is transversely striated, the striæ being distinctly separated; the sides are more closely striated; the lateral apical tooth is large, smooth, rounded, and slightly narrowed on the top; the apex of the segment has an almost perpendicular slope and is thickly covered with short white pubescence, the upper half rough, the lower finely transversely striated and furrowed down the middle. The propleuræ aciculated; near the bottom is a narrow furrow, above the middle is a wider, deeper, crenulated furrow, which does not extend quite to the end. The mesopleuræ opaque, hollowed above behind the tubercles, the middle with a broad belt of large deep irregular punctures; the lower edge is bordered by a distinct crenulated furrow. The upper half of the metapleuræ largely reticulated, the lower smooth. Wings hyaline; there is a broad smoky band occupying the whole of the radial, of the second cubital, the apex of the first cubital, and extending on to the apex of the second discoidal; the appendicular cellule is distinct, elongate, open at the apex; the first cubital cellule is, on the lower side, longer than the other two united; the first recurrent nervure is received in the middle, the second in the basal third of the cellule. Legs black; the penultimate joint of the fore tarsi is more dilated than the others; the base of the metatarsus is slightly incised; the claws bifid, the basal claw the smaller. Abdomen with the petiole as long as the dilated part of the segment, narrow, closely longitudinally striated.

Khasia Hills.

Mutillidæ.

The species here described have been taken chiefly at Barrackpore, Bengal, by Mr. G. A. J. Rothney. It is unfortunate that the male Mutillidæ should have to be described without reference to the females; but in our present state of knowledge there is no other course open to us. I am, how-

ever, glad to be able to fix beyond doubt the male of *M. sex-maculata*, one of the best-known of the Indian species.

I may take this opportunity of pointing out that Col. C. T. Bingham has omitted from his 'Fauna of British India, Hymenoptera,' *Mutilla indefensa*, Cam., described by me ('Memoirs Lit. & Phil. Soc. Manch.' xli. p. 63) from Bombay.

i. *Clypeus bidentato*.

Mutilla bidens, sp. n.

Nigra, abdominis segmentis 1° et 2° rufis; clypeo emarginato; alis fusco-violaceis, basi fere hyalinis. ♂.
Long. 9-10 mm.

Scape of antennæ shining, sparsely punctured, above with a few white hairs; the flagellum stout, distinctly tapering towards the apex; opaque, covered with a pale down; the third and fourth joints equal in length. Vertex shining, behind the ocelli coarsely and closely punctured, at their sides much more sparsely punctured; the ocellar region distinctly raised, strongly punctured all over; the ocelli are placed at the sides of the raised part. Clypeus raised gradually from the base to the apex, the sides also raised; the apex is deeply and roundly incised in the middle, the sides at the apex appearing as stout, large, bluntly triangular teeth; the apex on the lower side truncated. Mandibles with only one long apical tooth; the tooth on the lower side behind the middle is large, the base is punctured and covered with long white hair. Pronotum coarsely punctured, its hinder edge distinctly raised; the pleuræ have some stout, irregular, oblique keels; in front of the tegulæ is a large patch of dense silvery pubescence; the remainder is sparsely covered with long pale hair. Scutellum not much raised, shining, the sides bearing large, deep, widely separated punctures and long black hairs; the middle is smooth and shining; there is a furrow down the base in the middle and a longer one, slightly narrowed in the middle, on the apical part. The basal half of the median segment has a thick covering of white pubescence which completely hides the texture; the apex has an oblique slope, is reticulated and covered rather thickly with long fuscous hairs. Mesopleuræ coarsely punctured in the middle, thickly covered with longish white hair; the apical half of the metapleuræ reticulated. Legs thickly covered with white hair; the calcaria white. Wings fuscous, with a slight violaceous tinge, paler, more hyaline at the base, the nervures dark

fuscous, the radial cellule short and wide; the basal abscissa of the radius is sharply and distinctly angled above the middle; the apical is straight above, oblique below; the second and third cubital cellules are equal in length above; the first recurrent nervure is received shortly beyond, the second almost in the middle of, the cellule; the radial and cubital cellules are lighter in tint than the apex of the wings. Abdomen black; the second, third, and the base of the fourth segments ferruginous; the petiole is coarsely punctured, its apex and the apices of the second and third segments are fringed with golden pubescence; the other segments are fringed with white; the pygidium is covered with long black hair; the ventral keel is curved, its apex projecting into a large somewhat triangular tooth; on the sides of the hypopygidium is a large, stout, slightly curved keel, which becomes gradually larger towards the apex as seen from the sides.

This species forms the type of a new group, which may be defined as follows:—

Clypeus largely projecting, becoming broader from the base to the apex and hollowed in the middle; the apex ends in two large somewhat triangular teeth. Mandibles longish, the apex ending in one long tooth; the lower tooth is large. Ocellar region raised. Eye-incision rounded at the base. Pronotum raised behind. Mesonotum without longitudinal furrows. Scutellum furrowed down the middle. Radial cellule short, wide; there are three cubital cellules. Basal segment of the abdomen subsessile; the last ventral segment provided on either side with a stout keel, which becomes gradually wider towards the apex. On the inner side of the hinder coxæ at the apex is a stout shining tooth, rounded at the apex.

The occiput is not sharply margined, the pronotum is raised behind; the parapsidal furrows distinct; on the lower side of the second abdominal segment is a longitudinal keel, covered with a short pile; below this is a smooth, glabrous, broader keel.

ii *Clypeus not bidentate.*

a *Scutellum distinctly conical.*

Mutilla cona, sp. n.

Nigra, abdomine rufo, basi apiceque nigris; capite thoraceque dense argenteo-pilosis; scutello rugose punctato; alis fusco-violaceis. ♂. Long. 17 mm.

Scape covered with longish hair, grooved beneath; the

third and fourth joints are nearly equal in length. Head below the ocelli thickly covered with longish white pubescence, the vertex more sparsely with shorter pubescence intermixed with long fuscous hair. Clypeus smooth and shining, depressed, the sides slightly, the apex more distinctly raised; the front and vertex strongly punctured, smooth at the sides of the ocelli, which are distinctly raised. Mandibles at the base thickly covered with white intermixed with fulvous hair; the pulpi black. Pronotum strongly punctured, thickly covered with silvery pubescence; the sides of the pleuræ with stout widely separated keels. Mesonotum deeply rugosely punctured, the punctures running into reticulations and much larger and deeper towards the apex; the hair is long and black. Scutellum strongly rugosely punctured except in the middle on the extreme apex above, this portion having a shallow furrow in the middle; the hair on the base is black, on the apex longer and paler; the postscutellum is smooth in the middle, the sides punctured. The base of the median segment is thickly covered with depressed silvery pubescence, which completely hides the texture; the apex is closely reticulated and covered with long fuscous hair. The middle of the mesopleuræ is sparsely and shallowly punctured and thickly covered with white pubescence; the metapleuræ reticulated except at the base above and in the middle. Mesosternum rugosely punctured except in the middle. Legs thickly covered with long white hairs, the spurs pale. Wings fuscous violaceous; the basal abscissa of the radius is straight, oblique; the apical is roundly curved above the middle; the first transverse cubital nervure is oblique, with only a slight curve. Basal segment of the abdomen black except at the apex, and is covered with long white hair; the ventral keel at the apex projects into a short somewhat triangular tooth; the second to sixth segments are covered with fulvous hair; the last segment is entirely black and thickly covered with long black hairs; the middle is smooth and shining; the last ventral segment has on either side a distinct smooth conical tooth, followed by a much larger one, which is curved above and obliquely narrowed on the lower side.

This species agrees in form, pubescence, and coloration with the male of *M. sermaculata*, Swed., but is quite distinct. The two species may be separated as follows:—

Scutellum in the middle above broadly smooth and shining throughout; the median segment not thickly covered with white pubescence; the sides of the apical two ventral segments marked with stout oblique keels *sermaculata*.

Scutellum rugosæ above, the extreme apex only smooth ;
 the median segment thickly covered with white
 pubescence, which hides the sculpture ; the sides
 of the apical two ventral segments armed with
 stout teeth *cona*.

M. cona may further be known from *sexmaculata* by the wings not being so deeply violaceous and by having hyaline streaks in the cubital cellules, by the scutellum not being so distinctly pyramidal, by the metathorax not being so distinctly narrowed at the base, by the smaller ventral keel, and by the more strongly punctured mesosternum.

Various species have been regarded as the male of *M. sexmaculata*, but there has always been some doubt under what name, if any, the male has been described. I am now able to put the matter at rest, Mr. G. A. J. Rothney having taken *sexmaculata* ♀ *in cop.* with its male. I am not sure if this male has been described by anyone ; but it comes nearest to the description of *dimidiata*, Lep. sec. Bingham. The true male is from 20–24 millim. long, is black, with the abdomen red, black at base and apex, the head and thorax deeply covered with white pubescence, and the wings deeply violaceous. Its characteristic points are the pyramidal scutellum, which is broadly smooth and shining above ; the ventral keel, projecting shortly beyond the middle into a stout somewhat triangular tooth ; the apical two ventral segments are marked on either side with a stout somewhat oblique keel ; the upper part of the apical ventral segment at the sides is smooth and shining ; below this, and above the keel, it is closely punctured ; the upper part of the mesopleuræ is tuberculate, as is also the lower, but to a less extent.

Mutilla selma, sp. n.

Nigra, apice petioli segmentisque 2°–5° rufis ; alis violaceis. ♂.
 Long. 12–13 mm.

Scape of antennæ sparsely covered with long white hairs. Front rugosæ ; the vertex sparsely covered with strong punctures ; clypeus smooth, shining, glabrous, the middle indistinctly keeled. Mandibles shining, broadly rufous before the apex, smooth, sparsely covered with long white and fulvous hair ; the tooth on the lower side at the base is large, longer than broad, rounded at the apex. Pronotum rugosely punctured, the base and middle to near the apex smooth and shining. Mesonotum shining, deeply punctured, the punctures large, deeper and more widely separated towards the apex, sparsely covered with black hair ; the furrows are

moderately wide and deep and reach to the apex; between them at the base in the middle is an elongated smooth spot. Scutellum pyramidal, rugosely punctured, the middle smooth and shining, produced at the apex into a rounded point; at the base is a slight triangular depression. The median segment has a rounded slope, is reticulated, and covered with long pale fulvous hair; the central area is elongated, slightly widened at the base, the sides there oblique. Propleuræ stoutly obliquely striated except at the apex. Mesopleuræ coarsely punctured and sparsely covered with long fulvous hair in the middle, the apical half of the metapleuræ strongly reticulated. Legs thickly covered with pale hairs; the tarsal spines rufous, the calcaria pale. Wings uniformly violaceous; the second cubital cellule at the top is nearly one fourth longer than the third. Abdomen rufous; the petiole, except at the apex, and the apical two segments black; the hair on the basal segment is pale, on the middle pale fulvous, on the apical black intermixed with pale; the apex of the pygidium is depressed and sparsely punctured; the middle in front of this depression is slightly raised and smooth. The keel on the basal ventral segment is stout, dilated broadly at the base; the hypopygium is dilated in the middle, the dilatation becoming gradually larger towards the base.

Mussooree, N.W. Himalayas.

Mutilla fortinata, sp. n.

Nigra, dense albo-pilosa, abdominis segmentis 1°, 2°, et 3° ferrugineis; alis fusco-violaceis, basi fere hyalinis. ♂.
Long. 12-13 mm.

Scape of antennæ thickly covered with white hairs; the third and fourth joints are almost equal in length, the apical joints are slightly roundly dilated above. Front and vertex strongly punctured, covered with long pale hairs, the front also thickly covered with silvery pubescence; the antennal keels are stout, projecting and curved. Clypeus smooth, shining, glabrous, broadly distinctly keeled in the middle, the sides from the keel oblique; the apex is transverse, the sides oblique, so that the inner side appears depressed. The base of the mandibles thickly covered with long white hairs, the apex on the lower side more sparsely with long golden hair; the basal tooth is stout, blunt. Pronotum strongly rugosely punctured, smooth and shining at the base; the upper part of the propleuræ strongly rugose, the middle with stout keels, the lower part smooth. Mesonotum punctured, shining, thickly covered with long black hair; the furrows

are deep; opposite the tegulæ is a smooth irregular longish line; the median segment closely reticulated, thickly covered with silky pubescence; the central area is dilated at the base, its sides oblique. Scutellum pyramidal, coarsely rugosely punctured, the centre raised, smooth, shining, the base covered with long black, the apex with longer fuscous, hair. Postscutellum smooth, bordered laterally with stout keels. Mesopleuræ punctured in the middle and covered thickly with silvery pubescence; on the lower side of the base is a club-shaped keel. Metapleuræ reticulated, smooth at the base. Wings fuscous violaceous, paler at the base; the second cubital cellule is longer above and below than the third, the second and third transverse cubital nervures are sharply angled above the middle; the recurrent nervures near the base of the apical third of the cellules. Legs thickly covered with long white hair. Petiole strongly punctured; the basal teeth stout, the sides immediately in front of them project; the ventral keel is roundly and uniformly incised in the middle. The pygidial area is smooth in the middle at the base, the apex is depressed and obscure rufous in the middle; the hypopygium is stoutly obliquely keeled laterally; the penultimate segment is keeled. The pubescence on the basal segments is white, on the middle long and golden, on the apical black.

b *Scutellum not distinctly conical, the fore wings more or less hyaline at the base.*

Mutilla lena, sp. n.

Nigra, abdomine ferrugineo, apice basique petioli late nigris; alis fusco-violaceis, basi hyalinis. ♂.

Long. 10 mm.

Antennæ longish, the scape above covered with longish white hair, below much more thickly with short pale pubescence; the flagellum almost glabrous, the third and fourth joints equal in length. Front and vertex shining, rather strongly punctured, the vertex sparsely covered with fuscous hair; the front with a broad band of silvery pubescence. Clypeus shining, its apex roundly projecting, the inner side shallowly but distinctly depressed, and finely transversely striated at the apex. Mandibles finely punctured at the base and sparsely covered with long silvery hair; the tooth on the lower side large, longer than broad, conical. Pro- and mesonotum shining, strongly punctured; the pronotum thickly covered with long fuscous, the mesonotum more

sparsely with shorter black, hair: the two furrows are deep and wide. Scutellum scarcely raised above the level of the mesonotum, strongly punctured, the middle on the basal part smooth and shining, the smooth part slightly depressed in the middle at the base; the postscutellum finely rugose. Median segment reticulated, the apex more closely below, its upper part more irregularly and with a keel down the middle; the reticulations on the basal half are large and irregular; the central area is wide, slightly widened at the base, and it reaches to the apex. There is a large, stout, curved keel near the base of the propleuræ; in the middle are three oblique ones; mesopleuræ rugosely punctured except behind, in the middle thickly covered with white pubescence; the apex of metapleuræ reticulated. Mesosternum smooth and shining. Legs black; the hair, calcaria, and spines white. Wings dark fuscous violaceous; the nervures black; the second cubital cellule at the top is slightly longer than the third; the first recurrent nervure is received shortly beyond the middle; the upper part of the radius is only at a slightly different angle from the lower. Abdomen ferruginous; the base of the petiole and the apical segment black; the penultimate segment piceous black; the petiole is strongly but not closely punctured; the ventral keel is slightly roundly curved and a little dilated towards the apex; the pygidium is closely punctured, smooth in the middle; the hypopygium has a stout oblique keel on the sides, which projects into a triangular tooth at the apex.

Mutilla fianna, sp. n.

Nigra, abdominis medio late ferrugineo; medio scutello lævi; alis fusco-violaceis, basi hyalinis. ♂.

Long. 13-14 mm.

Front and vertex strongly punctured, the middle of the front thickly covered with silvery pubescence, the vertex sparsely with long fuscous hair. Clypeus smooth, the apex slightly and finely transversely striated, transverse, the sides oblique. Mandibles at the base thickly covered with long pale fulvous hair; the apical joints of the palpi dull testaceous. Pronotum strongly punctured; the upper third of the propleuræ slightly hollowed, smooth, the rest bearing six or seven stout keels. Mesonotum shining, strongly punctured, sparsely covered with stiff black hairs; the two furrows are wide and deep; in its centre in front is a smooth shining line. Scutellum scarcely raised above the mesonotum, its apex has an

oblique slope; in the middle is a flat, smooth, shining, broad space, which becomes gradually and slightly wider towards the apex, which is slightly incised in the middle. Median segment thickly covered with depressed pale fulvous pubescence; reticulated; the central area large, reaching to the apex, becoming slightly narrowed to the end of the basal third, then more distinctly narrowed towards the apex; the keel surrounding the apical part is stout; the apex itself has a sharply oblique slope and is closely reticulated all over. Mesopleuræ strongly punctured and thickly covered with white hair. Metapleuræ strongly reticulated except at the base. Legs thickly covered with pale hair; the tarsal spines fulvous. Wings deep fuscous violaceous, the base hyaline; above the second cubital cellule is slightly longer than the third; both the cellules receive the recurrent nervures shortly behind the middle. Abdomen ferruginous; the petiole, except at the apex, and the apical two segments black; the ventral keel has a slight curve and projects slightly towards the apex; the middle segments are slightly punctured and fringed with fulvous hair; the last segment is strongly punctured except down the middle.

Mutilla cara, sp. n.

Long. 9 mm.

In Bingham's table (p. 9) this species comes into "*b*¹. Wings dark fulvous, with a purple effulgence," and "*d*². Second to fifth segments red," but is very different from anything there described. It differs from most of the species in the central area of the median segment being of equal width throughout.

Scape of antennæ thickly covered with long white hair, grooved beneath; the flagellum stout, thickly covered with a microscopic pile; the third and fourth joints subequal. The front and vertex punctured, thickly covered with silvery pubescence and more sparsely with long pale hair; the eye-incision deep. Clypeus shining, smooth, bare, triangular. Mandibles rufous in the middle, the base thickly covered with long hair. Pro- and mesonotum strongly punctured, thickly covered with long blackish hair; it has two longitudinal furrows, which are deeper and wider behind. Scutellum coarsely rugosely punctured; on the basal half in the centre is a smooth shining space, of equal width and slightly raised and projecting at the apex. Median segment reticulated, the reticulations longer on the basal half, which is, especially in the middle, thickly covered with pale fulvous down; its central area extends to the apex of the basal portion and is of

equal width throughout; the apex has an oblique slope and is covered with long pale hairs. Propleuræ shining, slightly hollowed; the lower part with four stout keels. Mesopleuræ strongly punctured in the middle, the base and apex smooth. Metapleuræ smooth, the apex strongly reticulated; the base on the lower side faintly and irregularly reticulated. Sternum smooth and shining. Legs black, thickly covered with white hair on the femora and tibiæ; the hair on the tarsi stiffer and more rufous in tint, especially on the lower side. Wings uniformly fuscous violaceous; the nervures and stigma black, the second cubital cellule at the top is slightly, at the bottom more distinctly, longer than the third; both the recurrent nervures are received near the base of the basal third of the cellules. Abdomen ferruginous; the petiole, except at the apex, and the last segment black; the petiole sparsely punctured, the sides covered with long pale hair; its ventral keel straight, only very slightly projecting at the base; the second to fifth segments ferruginous, their apices broadly covered with bright golden hair; the apex of the penultimate segment is black and covered also with golden hairs; the last segment is punctured, smooth down the middle, and covered with long white hairs.

Mutilla zodiaca, sp. n.

Nigra, abdomine rufo, apice nigro; capite thoraceque dense albolpilosis; alis violaceis. ♂.

Long. 8 mm.

Antennæ stout, black; the scape covered with silvery hair, the flagellum with a pale pile. Head densely covered with longish silvery pubescence, which hides the sculpture on the front and vertex; the clypeus thickly covered with long silvery hair. Mandibles broadly rufous in the middle, the base thickly covered with silvery pubescence. Pronotum thickly covered with silvery pubescence; the pleuræ smooth except for a few indistinct striæ. Mesonotum coarsely punctured, shining, sparsely covered with longish black hairs; the two furrows are wide and deep. Scutellum rugosely punctured. The apical half of the median segment is thickly covered with depressed silvery pubescence, which completely hides the surface, which is reticulated; the apex has an oblique slope, is closely reticulated, and is covered with long white hair. Mesopleuræ punctured and thickly covered with silvery pubescence in the middle; the apex of the metapleuræ is reticulated; the base on the lower side is obscurely punctured. Mesosternum opaque, covered with

long pale hairs, its base with a row of punctures. Legs black; the four anterior trochanters rufous; the calcaria pale; the hair is long and dense. Wings fuscous violaceous; the stigma and nervures deep black; the second and third cubital cells are equal in length at the top; below the second cell is nearly twice the length of the third and receives the recurrent nervure in the middle; the second recurrent is received in the basal third. The petiole is sparsely covered with large punctures and with long pale hair; its basal teeth are large; the ventral keel is short, thick, and straight; the apical half of the segment is sharply oblique; the second to fifth segments are thickly fringed on the apex with long fulvous hair; the apical with paler fulvous hair; the pygidium is punctured throughout, the punctures stronger towards the apex, which is transverse. Ventral segments punctured, smooth at the base. The tegulae bear large scattered punctures and have the edges behind rufous.

Allahabad.

Thynnidae.

Methoca violaceipennis, sp. n.

Nigra, dense albo-hirsuta; alis violaceo-hyalinis, nervis stigmatibus nigris. ♂.

Long. 12 mm.

Antennae black; the scape covered thickly with long fuscous hair; the flagellum densely with short stiff pubescence. Head black, the labrum fuscous, smooth. Clypeus roundly incised at the apex, which is oblique and ends in the middle above in a smooth tubercle-like projection; it is strongly aciculated. The front coarsely punctured; on its lower half in the middle is a wide furrow with oblique sides; the vertex is less strongly punctured. The face, cheeks, and outer orbits are thickly covered with long white, the front and vertex more sparsely with fuscous, hair. Thorax black, shining, thickly covered with white hair; the pronotum roundly, but not much, narrowed in front, distinctly but not very strongly punctured, except at the apex; the mesonotum similarly punctured; the sides near the base depressed and closely transversely striated; on the outer side of the depression is a longitudinal furrow which reaches to near the apex. Scutellum punctured like the mesonotum, its base transverse, obliquely depressed; the upper part of the depression smooth and separated from the lower, which is closely rugose. Median segment closely rugosely punctured; above the middle it is

transversely striated, the striæ running into reticulations which are stronger in the centre. Pro- and mesopleuræ closely punctured except at the apices; the metapleuræ rugosely punctured except at the base above; the basal furrow distinct, deep, and marked all over with short stout keels. Mesosternum closely punctured, except in the centre; the furrow is wide and deep and becomes wider and deeper towards the apex. Near the base the mesopleuræ are raised; the apex of the raised part curved above, and it is marked at irregular intervals with some stout keels. Legs black, covered with white hair, the calcaria rufous. Wings fusco-violaceous; the stigma and nervures black; the first transverse cubital nervure is oblique, faint above, completely obliterated below; the first recurrent nervure is received shortly beyond the middle, the second in the basal third. Abdomen shining, the basal segments slightly, the apical strongly punctured; the segments strongly constricted at the base, most strongly on the lower side; the constriction on the second segment finely striated.

As the fact is not alluded to by Col. Bingham, it may be pointed out that the males in this genus have hairy eyes. This makes the fourth Indian species.

Khasia Hills.

IV. — *The Larval Stage of Hypoderma bovis.* By P. KOOREVAAR, Veterinary Surgeon to the Amsterdam Public Abattoir *.

AT a meeting of the Nederlandsche Dierkundige Vereeniging held in October 1895 Dr. C. Ph. Sluiter exhibited certain *Æstrus*-larvæ which had been found by myself in the spinal canal of a young bullock.

Since then I have met with *Æstrus*-larvæ in the vertebral canal in the case of a large number of cattle from nine to eighteen months old and in certain full-grown animals up to the age of six years.

The larvæ lie freely in the fatty tissue between the dura mater spinalis and the periosteum, especially in the hindmost portion as far as the cauda equina.

In the fresh condition the larvæ are of a transparent white colour, with a light green interior. They are segmented and oblong in shape; the segmentations are more distinctly

* Translated by E. E. Austen from the 'Tijdschrift der Nederlandsche Dierkundige Vereeniging,' 2^{de} serie, deel v. (1898) pp. 29-34.

visible in specimens preserved in spirit than in the fresh larvæ.

The dimensions of these spinal larvæ vary considerably ; in a collection that I formed between October and February there is one specimen measuring 5 millim. in length by $\frac{1}{2}$ millim. in breadth ; the remainder are from 6 to 14 millim. long and from 1 to $2\frac{1}{2}$ millim. broad.

In the warm fat, before it has become solid, the larvæ lie extended ; if they are set free they assume a curved shape and contract, becoming in consequence considerably shorter and thicker ; in this contracted condition the annulations are also distinctly visible. As regards other details these grubs have the characteristics of *Cestrin* larvæ.

In the year 1884 M. Hinrichsen, a veterinary surgeon, in dissecting a tuberculous bullock, found the first specimen of these larvæ in the spinal canal ; in 1888 he published in the 'Archiv für wissenschaftliche und praktische Thierheilkunde,' Bd. xiv., an account of the examination of thirty-nine cattle.

In the case of fourteen of these (for the most part the younger animals) he met with from one to twenty larvæ in a portion of the vertebral column. So long ago as 1863 Prof. Brauer described and figured these larvæ in his 'Monographie der *Cestrin*,' but the fact that they occur in numbers in the spinal canal was nevertheless new.

Further statements as to the finding of these larvæ in the neural canal in cattle are also given by Hinrichsen, Horne, and Ruser in the 'Zeitschrift für Fleisch und Milchhygiene' for 1895.

Hinrichsen considered these *Cestrus*-larvæ to be the first stage of *Hypoderma bovis*, which was till then unknown ; and Prof. Brauer agreed with this opinion.

Owing to the frequent occurrence of this larva in the spinal canal Horne was led to consider the latter as the normal hidden resting-place of *Hypoderma bovis*.

In the middle of January I met with the first specimens of *Hypoderma*-larvæ beneath the skin ; on a closer examination ten more *Cestrus*-larvæ were found in the epidural fat of the vertebral canal.

The occurrence of *Hypoderma*-larvæ beneath the skin, in what are known as warbles, and at the same time of *Cestrus*-larvæ in the spinal canal in the same animal, was repeatedly observed in the months of January, February, and March in the slaughtered cattle at the abattoir.

It is remarkable that in size and form the largest spinal larvæ do not differ from the youngest *Hypoderma*-larvæ in the subcutis ; the subcutaneous larvæ are somewhat less

transparent; the older subcutaneous larvæ (third stage) are dull white and marked with darker transverse bands; later on they become noticeably thicker and pyriform; the colour changes to more of a greyish yellow, and subsequently to dark brown; these larvæ have become incapsulated, have perforated the integument, and produce the well-known warbles in the skin.

In the months referred to one frequently finds that the spinal larvæ have crawled out of the fat and are lying in the spaces between the vertebrae; occasionally they are found with one extremity in the intervertebral spaces.

On the 28th of last February [1896] I also made an interesting discovery; in a yearling beast with a large number of *Hypoderma*-larvæ beneath the skin—the subcutis on the back and loins was violently inflamed and suppurating—three spinal larvæ were discovered in addition. On examining the very oedematous œsophagus, I found thirteen *Æstrus*-larvæ in the connective tissue between the mucosa and the muscularis; in size, shape, and colour they were similar to the larvæ lying in the spinal canal.

In the same way on two occasions after this I also met with *Æstrus*-larvæ in the wall of the œsophagus. *Æstrus*-larvæ have likewise been found in the œsophageal wall by Curtice; it afterwards appeared that these were the larvæ of *Hypoderma lineatum*, which occurs in the United States.

The interesting statement is also made by Horne that in the case of a young bullock he found the whole carcass so full of *Hypoderma*-larvæ that it had to be withdrawn from consumption.

Are these spinal and œsophageal larvæ really those of *Hypoderma bovis* in the first stage?

The great agreement between the youngest subcutaneous and the largest spinal larvæ in the same animal, the appearance of larvæ under the skin, coupled with the disappearance of the larvæ from the spinal canal, is a strong argument in favour of the view that this is the case. It is remarkable that no single investigator has met with the larvæ on the way from the vertebral canal to the subcutis. Horne asserts that he has more than once noticed in the flesh dirty green larva-tracks, which led from the spinal canal through between the muscles to beneath the skin. In one instance, where both subcutaneous and spinal larvæ were present, a larva was met with between the spinous processes of the vertebral column; hitherto I have not seen definite larva-passages. It is true that when *Æstrus*-larvæ are present the epidural fat has a dirty yellow colour; sometimes there is found

in the fat a green granular mass; above it is flabby and œdematous.

With a view to making sure whether these spinal larvæ were the larvæ of *Hypoderma*, I inserted them under the skin of another animal, in order that they might there become adult and in order from them, if possible, to breed *Hypoderma bovis*.

I selected as subject of experiment a small dog, which since the beginning of January had been supplied with food infected with *Echinococcus veterinorum*. On February 3rd I introduced, under aseptic precautions, through an opening 2 centimetres wide, beneath the skin in the left lumbar region eleven spinal *Æstrus*-larvæ taken from a calf. The wound was closed and healed quickly, the state of the dog remained normal, and nothing was seen of the eleven larvæ inserted.

Eight days later in the same manner fifteen larvæ were introduced under the skin of the right side; scarcely an hour later one of my colleagues and I reopened the wound, and saw to our astonishment that all the larvæ with the exception of one had disappeared. Two days afterwards I observed a larva lying under the skin on the costal wall, 8 centimetres away from the wound; its rounded oblong form was distinctly visible through the thin skin of the dog; one could feel it roll under the finger. On the third day it had crawled forward as far as the spinous processes, and on the fourth it had disappeared.

The dog remained normal; fourteen days after the first insertion there was still nothing to be seen under the skin.

What had become of the twenty-six larvæ in the dog?

To settle the point I decided to open the animal.

The autopsy was interesting.

On removing the skin five still living larvæ were found in the subcutis—one on the left costal wall, one in front of the shoulder, one on the right thigh, one on the skull, and the fifth larva on the point of the jaw. In the subcutis and in the underlying muscles no traces of their wanderings were observable; but certain œdematous spots were found in the subcutis and the muscles.

On opening the abdomen some bloody matter exuded. Six larvæ were found between the folds of the intestine, and therefore free in the peritoneal cavity.

I found, further, five larvæ in the fat of the spleen, kidneys, omentum, inguinal canal, and the retro-peritoneal tissue; the removal of the kidneys disclosed three more larvæ upon the psoas muscles.

In the pleural cavities no larvæ were found lying free; still five larvæ were met with, three of which were in the wall of the œsophagus and two in the peritracheal tissue.

The discovery in the spinal canal was very remarkable; on exposing the cord it was found that two larvæ were ensconced in the fat between the dura mater spinalis and the periosteum: the fat around the place was somewhat softer and injected with blood.

All the twenty-six larvæ introduced were found, and for the most part alive.

They had wandered far in a relatively short time—eight to fourteen days after they had been introduced under the skin.

In spite of careful examination no traces or tracks of the course followed by the larvæ could be found.

Certain small oedematous patches were indeed present in the subcutis and between the muscles, and some bloody humour was found in the abdominal cavity.

On February 17th I introduced in the same manner twenty spinal *Æstus*-larvæ under the skin of an eighteen-months-old he-goat. So far as I am aware, the larvæ of *Hypoderma bovis* are not found in the goat.

On February 29th I found in the he-goat five subcutaneous swellings, each with a central opening, from which there exuded a dirty white fluid. I propose to allow these larvæ to mature.

I fed two young dogs simultaneously with spinal *Æstus*-larvæ, introduced into the pharynx by means of a spatula. The dogs were killed after two and four days respectively. On autopsy I have been unable to find a single larva outside the alimentary tract or remains of the larvæ in the stomach or intestine.

I introduced ten larvæ directly into the œsophagus of a rabbit by means of a rubber tube. For three days I examined the fæces; but neither in them nor in the rabbit, which I afterwards killed, could I find any trace of the injected larvæ.

As it appeared from the autopsy of the dog, the larvæ introduced under the skin wandered about into various places agreeing with those in which they are found in cattle. This discovery, in connexion with the negative result produced by the introduction of the larvæ *per os*, causes me to incline to the opinion that the young larvæ of *Hypoderma bovis* at first pass beneath the skin, and from thence betake themselves to the spinal canal and other places, to return later into the subcutis and there undergo further development under the well-known conditions.

I hope later on to publish a communication as to the discovery of the further development of the spinal larvæ beneath the skin of the he-goat.

March, 1896.

BIBLIOGRAPHICAL NOTICE.

The Pencyuk Experiments. By J. C. EWART, M.D., F.R.S., Regius Professor of Natural History, University of Edinburgh. (A. & C. Black.) 8vo. London, 1899. Pp. xciii, 177, with 46 illustrations distributed through text, process, mostly from photographs.

UNFORTUNATELY the title of this volume appears to be defective or misleading, and probably ought to have read '*Pencyuk Equine Experiments.*' The author may be surprised one day, should he find it in some library catalogues classed under currency-question subjects—for such things, and even stranger ones, not unfrequently happen. The binding of the book may save this contingency, for its zebraine style is strikingly characteristic. Once for all, we may say the illustrations are very effective (especially those of the foals and of the heads), showing the body, legs, and face-markings. At first we thought the repetition of a few of the figures was a mistake; but careful study of the text has led us to a different conclusion.

The somewhat long introduction (93 pages) is devoted to a consideration of zebra hybrids generally, to the principles of breeding of various domestic animals, to telegony (= infection), to saturation (= absorption of some of the elements or nature of parentage), and to sterility in equine hybrids. Then follows Part I., containing:—
A. The birth of a hybrid between a Burchell's zebra and a mare;
B. The zebra-horse hybrids.

Part II. enters into a more detailed or specific account of telegony, with observations on the striping of zebras and horses and on reversion in the Equidæ. An appendix to the latter deals chiefly with letters and observations of others on telegonal experimental breeding, and it ends with remarks on the desirability of trial of some fifteen different sorts of crosses between the horse tribe, cattle, sheep, and swine.

A considerable portion of the contents of this book has at various intervals appeared as contributions to '*The Veterinarian*,' and one paper in '*The Zoologist*,' besides lectures delivered at the Royal Institution. To a certain section of the public then it is not entirely new matter; but as collected in one handy illustrated volume it will be much more accessible to naturalists and the general public, many of the latter now taking a deep interest in this and cognate subjects.

So far as we can judge, we believe we are in approximate agreement with the quintessence of Prof. Ewart's volume, namely, his views on Reversion; yet at the same time we may own to at first having been bewildered by the reiteration of data and the same differently expressed. This leads us to think that, instead of reprinting the separate papers previously published in journals, and endeavouring to connect them together by a general introduction, the author himself saying "which must also serve as a preface and, to a certain extent, as a supplement," it would have enhanced the work if it had been entirely recast into a continuous whole. But

then condensation implies labour, and in the end does not look so much. The literary style is both easy and popular.

Prof. Ewart's experiments on crossing members of the Equidæ commenced in the beginning of 1895 at Penycuik, Midlothian, Scotland, where he set up a small stud-farm. His first cross-breed was between a male Burchell's zebra (*E. Burchellii*, var. *Chapmani*) and a female black-coloured West Highland pony. From them was derived a young male hybrid ("Romulus"). This has the united characters of both parents, though different from both and not mule-like. The neck and head are of zebra-form, the body and limbs more resemble those of the horse, though the hoofs are zebrine. The body-colour shortly after birth showed up chiefly as bright golden yellow, with rich dark brown stripes.

According to Ewart the stripes and other markings bear more resemblance to those of the Somali zebra (*E. Greyi*) than to Burchell's species. Before many months the colt began to shed its coat and afterwards to darken in tint, and this has increased in density. In temper, though ordinarily quiet, yet at times he is as easily excited, restless, and startled when seeing strange objects as is his sire the zebra. He carries himself proudly and with as dainty a step and dignity as the zebra.

The second cross was between an Irish mare, a bay with black points, and the above Burchell's zebra. The foal (a male, named "Remus") is much lighter in colour than "Romulus," to wit a rich light bay. The plan of the striping of this second hybrid is similar to the first, the bands of a dark reddish hue. Before long the mane assumed a somewhat erect attitude. As it shed its coat some months after birth, this was renewed by a thicker bay and brown inner one and an outer longer stronger-haired fringe. All four limbs have warts (chestnuts). Curiosity has been the chief feature in this animal as a foal.

The third hybrid was a cross between the same male Burchell's zebra and a Clydesdale mare—a bay with black points, white forehead, heavy mane and tail, and plenty of hair at the fetlocks. At birth this female hybrid ("Brenda") was much like an ordinary bay foal; but shortly after faint indistinct striping began to appear, though even afterwards not strongly marked. The right hind leg wart is wanting in this animal. Brow-arches, as in the other hybrids, do not round, but are more pointed, as in a Norwegian pony and a quagga at Amsterdam. The banding of the neck and body generally agrees with the stripes of the male hybrid no. 1, though less pronounced and with a tendency to shadow-stripes. Heavily built, with mule-like ears and tail, she is, so to say, a high-stopper in action.

Prof. Ewart's fourth zebrine hybrid (a female) is the product of a black female Shetland pony, and, as he states it, "is more of the zebra than any of my other hybrids." The body is of a leathery dun shade, partly reddish brown, with nearly black stripes, and there are stripes, not spots, across the loins and croup, with brow-arches as in no. 1 hybrid. The hoofs are longer than in

the zebra, and warts are deficient on the hind legs; the mane is short and upright in summer, long and pendent in winter. This fourth hybrid ("Nolette") has been more intelligent than the others and quieter in disposition; her appearance is quaint, with an old-fashioned bygone-age look.

The fifth hybrid ("Heckla") is the produce of a skewbald Iceland pony. The dam has much white about her, and with a pale yellow body-tint. The experimenter expected the female offspring would be nearly as light in body-tint as the male Burchell's zebra parent; but, instead, this foal is the darkest of all the zebrine hybrids. Her coat is heavy, though she agrees in the main in build and markings with no. 1 hybrid ("Romulus"). Her action is freer, though more like that of a hackney than a zebra.

Some of the above dams were afterwards put to horses, and this second progeny receives full description from the author, part of which is referred to under teleony. The above five hybrids and other cross-breeds, along with further experiments on pigeons, fowls, rabbits, and dogs by the author, and references and comparisons with the labours of others in the field of hybrid produce, form the basis of the general introduction and of the chapter more particularly devoted to Teleony and Reversion among the Equidae.

We need hardly make special reference to the chapter on "The Principles of Breeding" in the General Introduction, as some of the data again crop up when the transmission of characters is discussed. We may note *en passant* that in allusion to the third-week embryotic condition of the horse, when it becomes a bent-double fish like creature, he says "the tail is bilobed like that of a mermaid, manatee"—surely a slip of the pen for dugong? (see Ryder, Develop. of Cetacea, Rep. U.S. Fisheries for 1885).

With regard to the fascinating doctrine of Infection of the Germ-plasm—Weismann's Teleony—Prof. Ewart speaks pretty strongly from his own experiments and others' investigation of the subject. He says:—"The result, so far, is that the evidence in support of undoubted 'infection' having even occurred is most unsatisfactory. In every case investigated the supposed infection could be accounted for by the relatively simple reversion hypothesis. . . . I do not by any means say teleony is impossible, that it never has occurred in the past and never will occur in the future; but I think I am justified in saying 'infection' has never been experimentally produced, and that the kind of 'infection' so widely believed in by breeders, if not impossible, is at least extremely improbable." He goes on to mention the oft-quoted Lord Morton's mare, which Ewart does not believe was infected by the quagga, and he gives figures and argument thereon.

Ewart further refers to his own experiments, and describes foals subsequently got from the several dams (*supra*) by horses after their having had foals by Burchell's zebra. These did not support the teleony hypothesis. As a climax he says, "I am now satisfied that [ordinary] foals are far more often marked with stripes—apparent or real—than is generally supposed."

The above views strongly support those held by Settegast *, Weismann †, Kuhn ‡, Nathusius §, as well as some authorities in this country ||, though it is opposed to Herbert Spencer ¶, Dr. Harvey of Aberdeen **, and others' explanation of the phenomenon.

Nor does the "Saturation" hypothesis find any more favour with Prof. Ewart. He quotes Bruce Lowe's definition †† of it, that at "each mating and bearing the dam absorbs some of the nature or actual circulation of the yet unborn foal, until she eventually becomes saturated with the sire's nature or blood, as the case may be." Prof. Ewart proceeds to show from others' and his own experiments that supposititious cases of saturation are but more pronounced ones of reversion, due to better nutrition of the germ-cells &c.

Concerning sterility in equine hybrids, he thinks it is not in obedience to any natural law they are so. His experiments lead him to believe that preferential mating accounts for much, especially in the horse tribe; while it is noteworthy that a number of species of other animals and plants yield when crossed fertile offspring.

Prof. Ewart enters into detail, and nicely figures the peculiarities and differences of the so-called species of zebras and hybrids. He considers the Somali zebra (*E. Grevyi*) the most primitive form. This with the mountain zebra (*M. zebra*) and the group of Burchell's zebras are to him distinct types, but they cannot be readily distinguished from each other by their markings. Therefore we may add that Mr. R. I. Pocock's excellent paper on "The Species and Subspecies of Zebras" (Ann. & Mag. Nat. Hist. xx. 1897) may well be studied for comparison, this author's presumed subspecies being well defined. He notes the gradual lessening of the stripes from north to south, being absent in the hindquarters of the quagga south of the Orange River. See also Sir W. Flower's remarks ('The Horse,' 1891) and P. L. Sclater's various memoranda on zebra species (P. Z. S.).

The question is started by Prof. Ewart, Were the ancestors of the horse striped? And as side-issues thereon he discusses the points as to face and head, neck, body, and leg-stripes. He concludes that the ancestral horse was striped in a manner intermediate between the common and Somali zebras. The croup- and rump-stripes he regards as comparatively a recent acquisition in the zebras. He suggests though that in pigs spots, and not dark bands, were the original coloration, these afterwards merging into stripes &c.

* 'Die Thierzucht,' Band i.

† 'The Germ-Plasm: a Theory of Heredity.' English translation by Prof. W. N. Parker.

‡ An experienced veterinarian of Halle, quoted by Weismann and Ewart.

§ 'Ueber Shorthorn Rindvieh,' &c.

|| See works of Darwin, Romanes, Galton, &c.

¶ 'Contemporary Review,' 1893, &c.

** A remarkable effect of cross-breeding quoted by Ewart.

†† 'Breeding on the Figure System,' quoted by Ewart.

We might instance the tapirs, swine, and some deer (all branches of the early trunk of the Ungulata), which in their youthful stages exhibit spotting, which afterwards is relatively effaced with increasing age.

Respecting Atavism, or Apparent Reversion, in the Equidæ, he refers to the ancestral dentition, to the five-toed ancestor, to occasional instances of cleft hoof, to at times a complete ulna in recent horses, as taking after the prototype of ancient equine forms. He instances *Protoluppus* and *Hipparion*, the former as the ancestor of the breeds of horses, the latter as common ancestor of asses and zebras, without giving any decided data thereon*.

Reference is made to Mr. Bateson's † limits of reversion getting credit for things sufficiently accounted for by variation. Nevertheless, Prof. Ewart says:—"The heredity problem is sufficiently difficult as it is, but if we are debarred from invoking the assistance of the reversion hypothesis, it will become hopelessly incomprehensible."

In substance he most justly observes that preponderance is given to the colour of the dermal system in experiments as bearing on reversion, while habits and general structure only occupy the background. Notwithstanding this cautious advice the author himself has fallen into the trap, though he has endeavoured to relieve the situation by sundry brief notes on the tempers and habits of some of his hybrids. But the fact is, coloration, and especially zebrine stripes, can be reasonably compared, whereas temperament and, necessarily, habits are physiological factors of uncertain value on which to base comparison.

To sum up: whatever the ultimate result of Prof. Ewart's experiments, it would seem as if we had advanced a short stage in the matter of Telegony and Reversion, though some of his deductions doubtless will be questioned. The researches so far are still in the initial stage, but they are a stimulus, and it is to be hoped may be further pursued. Finally, where is the index?—a marked omission in this volume—for the brief table of contents does not help much where direct references on special points are needed.

MISCELLANEOUS.

On Ecdysis in Insects, considered as a means of Defence against Animal or Vegetable Parasites.—Special rôles of the Tracheal and Intestinal Ecdyses. By J. KUNCKEL D'HERCULAIS.

By the experiments made by us in Algeria for the purpose of endeavouring to infect young Acridians (migratory locusts) by means of spores of the fungus that we discovered upon the adults—the

* For an excellent epitome of 'The Horse,' his ancestors and living relations, clothed in most popular language, commend us to Flower's volume, with its reference to the palæontological and other literature of the Equidæ. Tegetmeier and Sutherland's 'Horses, Asses, Zebras, and Mules, and Mule Breeding' (1895) may also be profitably consulted.

† See his 'Materials for the Study of Variation,' 1894.

Lachnidium acridiorum, Giard—we ascertained that the repeated moults of these insects, which take place on an average once a week, are opposed to the fixation of the spores upon the integuments *. On the other hand, if we consider that it is often the stigmatic apertures that, in the adults, serve as a means of penetration for the spores, and if we remember that, after the spores have germinated, the ramifications of a thick mycelium block up the tracheal trunks, producing the phenomena of asphyxia †, we are obliged to recognize that, in the case of young Acridians, the casting off, with the integument, of the internal coat of the tracheæ is a serious obstacle to the preservation of the spores in the medium suitable for their germination.

In the course of the mission that we are accomplishing under the government of the Argentine Republic, we have been enabled to make observations which give a larger bearing to these preliminary remarks.

In drawing attention to the rôle of the pigments in the phenomena of histolysis and histogeny which accompany metamorphosis in the case of the migratory locust (*Schistocerca peregrina*, Olivier) ‡, we showed that after each ocdysis these Acridians excreted pigmentary matter with the fæces, which were thus found to be coloured pink, instead of remaining greenish brown as in the course of each of the stages of their development. In following very closely the development of the Paraná locust (*Schistocerca paranaensis*, Burmeister), in order to see if we could not discover some peculiarity that might have escaped us, we have been led to examine the first excreta after the completion of metamorphosis; the result was that it was discovered that the fæces, like those of the African species, were charged with red pigmentary granulations. But this time, on pushing the analysis further, the microscopical examination showed us that these excreta were in reality a kind of sacs formed by the cuticle of the intestine. These sacs, immediately after being deposited, on being immersed in distilled water exhibited the most interesting peculiarities; from the very first they were seen to be inflated by large bubbles of air, which maintained them in suspension; these bubbles were nothing else than the remains of

* J. Künckel d'Herculais and Ch. Lançlois, "Les Champignons parasites des Acridiens" (C. R. de la Soc. de Biol. 9^e sér. t. iii. p. 490, June 20, 1891; 'Comptes Rendus,' t. cxiii. p. 1465, June 22, 1891; Ann. de la Soc. ent. de Fr. t. lxi., 1891; Bull. t. cvi., June 24).

† A. Giard, "Observations sur les Champignons parasites de l'*Acridium peregrinum*" (C. R. de la Soc. Biol. 9^e sér. t. iii. p. 492, June 20, 1891); A. Giard, "Nouvelles Études sur le *Lachnidium acridiorum*, Giard, Champignon parasite du Criquet pèlerin" (Rev. gén. de Bot. t. iv. pp. 459, 460, 1892).

‡ J. Künckel d'Herculais, "Le Criquet pèlerin, *Schistocerca peregrina*, Olivier, et ses changements de Coloration. Rôle des Pigments dans les Phénomènes d'Histolyse et d'Histogénèse qui accompagnent la Métamorphose" (Comptes rendus de la Société de Biologie, 9^e série, t. iv. p. 56, 1892; Comptes Rendus, t. cxiv. p. 240, February 1, 1892; Annales de la Société entomologique de France, t. lxii. Bulletin, p. 25, 1892).

the masses of air which fill the digestive tract in order to enable the metamorphosis to take place, as we have shown by our previous studies *; moreover, in the midst of the granulations resulting from the histolysis of the tissues and of the granulations of reabsorbed pigment, there were soon perceived a number of Gregarines. Thus, then, these Protozoa were got rid of like waste matter, in the same way as the products of histolysis. From this we may understand that each moult not only occasions the regeneration of the normal tissues, but that it also results in freeing the organism from the parasites which cause the denutrition of those tissues.

From these facts is to be deduced a series of results, some of which are physiological, while the others are of an essentially practical order. In fact if the observers, and this particularly applies to M. Louis Léger †, who have sought for Gregarine in the digestive tract of Acridians did not succeed in meeting with these parasites in the case of migratory locusts, while they found them in species belonging to the same group, the reason was that the locusts in question had rid themselves of the parasites by shedding their intestinal cuticle; between the ecdyses they abound in the Paraná locust; they diminish in number after each ecdysis ‡. On the other hand, everyone is aware that in Europe (in Russia, France, and other countries), in Africa (Algeria, Cape of Good Hope), as also in America (United States, Argentine Republic), great hopes have been founded upon certain parasitic organisms (fungi, bacilli, Protozoa) for arresting the multiplication of destructive insects, and especially of migratory locusts. But we see from these observations that these insects with rapid development are in possession of a very simple means of ridding themselves from these organisms, in being able to regenerate themselves at each stage of their development. Thus we are able to understand the resistance that, *under the conditions of normal existence*, insects are capable of offering to the contamination or disorganizing action of vegetable or animal parasites.—*Comptes Rendus*, t. cxxviii. no. 10 (March 8, 1899), pp. 620-622.

* J. Künckel d'Herculais, "Du rôle de l'Air dans le Mécanisme physiologique de l'Éclosion, des Mues, et de la Métamorphose chez les Insectes orthoptères de la Famille des Acridides" (*Comptes Rendus*, t. cx. p. 107, 1890).

† Louis Léger, "Sur une Grégarine nouvelle des Acridiens d'Algérie" (*Comptes Rendus*, t. cxvii., Dec. 4, 1893).

‡ This Gregarine belongs to the genus *Clepsidrina*, Hammerschmidt, and we shall term it *Clepsidrina paranensis*, for the double purpose of recalling the fact that it is found in the country watered by the Paraná, and that it infests *Schistocerca paranensis*, the migratory locust of South America. It is probable that it also inhabits the digestive tract of other species of Acridians. Although it attains the size of *Clepsidrina acridorum*, Léger, and though its deutomerite is consequently four times larger than its protomerite, it differs in the general shape of the deutomerite, which is ellipsoidal instead of being cylindrical, and in the coloration of the granulations of the endocyte, which are not tinged with reddish yellow, but are of a uniform yellowish white.

THE ANNALS

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[SEVENTH SERIES.]

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V.—*Notes on the Mollusca of the Arabian Sea, Persian Gulf, and Gulf of Oman, mostly dredged by Mr. F. W. Townsend, with Descriptions of Twenty-seven Species.* By JAMES COSMO MELVILL, M.A., F.L.S., &c.

[Plates I. & II.]

THE present paper constitutes the third of a series* written to further the elucidation of the large molluscan collections gathered from time to time during the past seven or eight years by Mr. F. W. Townsend, of the Indo-European Telegraph Service, mainly amongst the islands and bays of the Persian Gulf and that portion of the Arabian Sea impinging on the Mekran coast of Beluchistan as far as Karachi. In the second of these papers † a full account of the methods employed in dredging and of the area traversed, with sundry other particulars, is given; but it seems unnecessary to reproduce here any of these details, to which I would simply refer any who may be interested in the narration. Suffice to say that I hope some day to be able to prepare as complete a catalogue as possible of these collections, the

* Cf. Mem. Lit. & Phil. Soc. Manch. vol. xli. pt. 3, 1896-97, pp. 1-26; vol. xlii. pt. 2, 1897-98, pp. 1-39.

† L. c. pp. 3-7.

individual species already noted numbering about 1100, speaking roughly; and since labels have been carefully kept with each individual, stating the depth, locality, quality of ground, &c. at which found, I believe such a publication would be of much value to all who are interested in geographical distribution.

So little attention has been hitherto paid—not, indeed, until the last decade of this century—to the productions of the very extensive and prolific area having Bushire for its western and Karachi for its eastern limit, that it is hardly surprising to find what a wealth of hitherto unrevealed forms has been brought to light through Mr. Townsend's unremitting exertions, ably supported as he is by many of those with whom he is officially connected (*e. g.* Mr. B. T. Finch, C.I.E., Director in Chief of the Telegraph Department, Captain Tindall, of the S.S. 'Patrick Stewart,' and Mr. J. A. O'Maley), even though it has as yet been found impossible to exceed the 100-fathom limit, or, in fact, quite to attain it in dredging, and therefore no specialized abyssal forms have been received which would at all compare, for instance, with the results of the cruise of the 'Investigator' in the Bay of Bengal.

But, notwithstanding this, the results so far have been more than gratifying. About ten per cent. of the total number catalogued are new to science; these, with the exception of eight or ten differentiated by Mr. G. B. Sowerby*, have been all described by myself in the two papers already referred to, and the addition of the following twenty-seven will swell the total to more than a hundred new forms.

When, in 1893-96, at first in conjunction with Mr. A. Abercrombie, I drew up lists of Bombay marine mollusca, of which no less than fifty-two had to be described, I expressed a strong opinion that this fauna was highly specialized and the number of endemic forms unusually great. How within so few years this conviction has become utterly falsified may best be inferred from the fact that of the fifty-two species no less than thirty-one have been found to occur in the Townsend collection†, mostly dredged near Karachi and the coast of Beluchistan, thus tending to prove that while certain forms may be confined to the North Indian Ocean, their range is wide there, and they mostly occur plentifully if locally.

I would particularly draw attention, among the Pelecypoda

* Proc. Mal. Soc. Lond. i. pp. 214 & 278 *sqq.*

† A new figure of one of these, *Cerithiopsis (Seila) bandorensis*, Melv., being necessary, it is here given (Pl. I. fig. 12).

described in this paper, to a *Macrinula*, a *Lucina*, and *Cryptodon victorialis*, all three of unusual delicacy. In Gastropoda a fine *Fusus*, two *Mitra*, a beautiful *Natica*, and a *Lucuna*, the second of a northern genus to be described from tropical seas, are, perhaps, the most noteworthy. But there still are more Pleurotomidæ in proportion to other orders represented; indeed it is both curious and deeply interesting to observe how much that is fresh this highly organized assemblage of mollusks continues yearly to afford from all parts of the world and at all depths. One of our greatest desiderata is, and I fear may long continue to be, an up-to-date monograph of this group, fossil as well as recent, for it seems to me that certain *Drillia*, *Clathurellæ*, and *Mangilia*, especially, of the Tertiary formation run very close to, if they are not absolutely identical with, similar existing forms.

Fusus Townsendi, sp. n. (Pl. II. fig. 1.)

F. testa elegantior fusiformi, usque apicem rapide attenuata, cinerea, rufo-vel brunneo-purpureo suffusa: anfractibus 11, duobus apicalibus globulosis, vitrifactis, ochraceis vel brunceis inclusis, cæteris apud suturas multum impressis, longitudinaliter costatis, costis fortibus, crassis, ad medium acuticarinatis, et fusco-pictis, ultimo in anfractu ad numerum novem, superficie tota spiraliter arete filo-lirata, ad medium anfractuum perforti, interstitiis tenuiliratis; apertura oblonga, intus cinerea, striata; canali perlongo (ad 32 mm.), arete lirato usque ad basim; labio tenui; columella nitida, paullum reflexa.

Long. 80, lat. 24 mm. (sp. maj.).

„ 60, „ 19 „ (sp. min.).

Hab. Persian Gulf, dredged at 10-12 fathoms, in sand and mud, off Gais (or Kais), Hinderabi, and Sheik Shuaib Isles.

A fine species, with a resemblance to *F. tuberculatus*, Lamk., or *toreuma*, Mart., in miniature. Many examples were forwarded by Mr. Townsend, nearly all, even the most juvenile, covered, especially towards the apex, with *Leprælia*. Unlike *tuberculatus*, the dark coloration is on the ribs, not at the interstices. The colour varies from ochreous or stramineous to purplish brown on a grey ground; the whorls are eleven in number, two being apical and glassy brown, the rest are very strongly ribbed, all acutely angled in the middle of each whorl, the ribs showing here most prominently, with narrow white spaces surrounded by a dark brown coloration. The spiral liræ are very close and fine. Canal much produced; aperture oblong; mouth greyish within and

spirally striate. Outer lip thin. Columella shining, somewhat reflexed.

About twelve examples, all similar excepting in coloration.

Named in honour of the discoverer, Mr. Frederick W. Townsend, of Manora, Karachi.

Nassa (Hima) ischna *, sp. n. (Pl. I. fig. 1.)

N. testa parva, multum attenuata, apice acutissimo, cinereo-alba, læte infra suturas et ad medium anfractus ultimum (interdum inter costas solum, interdum undique) brunneo-fasciata. anfractus 9½, quorum 2½ apicales albi, vitrei, cæteris longitudinaliter costatis, costis coriugatis, apud ultimum in numero tredecim, undique spualiter liratis, ad costarum juncturam gemmuliferis, labro extus albo, incrassato, intus denticulato; columella alba, nitida, haud multum incrassata.

Long. 10, lat. 4 mm.

Hab. Persian Gulf, near Muscat.

A small but very striking *Nassa*, extremely attenuate and acuminate, ashly white, brightly banded just below the sutures and in the centre of the last whorl with brown, this sometimes only appearing in the interstices between the ribs, in other examples on the ribs as well, uniformly. The ribs are roughened with the gemmæ which appear at the point of juncture with the spiral liræ. On the last whorl there are about thirteen ribs. The whorls are about nine and a half; of these the apical are white, glassy, and shining. The aperture is ovate; outer lip white, shining, thickened, within denticulate; columella only slightly thickened, white, shining.

There seems much in common, save for form, between this species and *N. mamillifera* †, Melv., also from the Persian Gulf, which I originally designated as belonging to the subgenus *Niotha*, Ad. I should now be disposed to place both these forms in *Hima*, Leach. These subdivisions are in some instances quite misleading, and I have found occasionally a species that might almost equally well belong to two or three of them. *Niotha* is characterized as differing from *Hima* in three salient particulars:—

- (a) In short as against elevated spire.
- (b) Very large callus, compared with a callus only “defined.”
- (c) Outer lip with no, as opposed to a conspicuous marginal, varix.

A few examples, in fine condition, occurred.

* *ἰσχνος*, thin, attenuate.

† Mem. Lit. & Phil. Soc. Manch. vol. xli. pt. 3, p. 4 (1893-97).

Drillia theoreta *, sp. n. (Pl. I. fig. 2.)

D. testa mediocri, eleganter fusiformi, albo-purpurascente; anfractibus $10\frac{1}{2}$, quorum apicales $1\frac{1}{2}$ vitrei, globosi, læves, cæteris fortiter et longitudinaliter rotundi-costatis, costis ultimum ad anfractum in numero decem, undique spiraliter arcuæ filo-liratis, superficie ad suturas brunneo maculata et his illic ad liras eodem colore sparsa; apertura ovato-oblonga, intus purpureo-fusca, vel, interdum, albescente; labro haud multum incrassato, sinu excavato, lato; columella recta; canali breviter producto.

Long. 22, lat. 6 mm. (sp. maj.).

„ 15, „ 4.50 mm. (sp. min., forma albescentis).

Hab. Henjam Island, Persian Gulf, 20-25 fathoms, and Sheik Shuaib Island, one large form.

Several examples. An attractive form, showing no variation in sculpture, but some in coloration and size. The albino variety is smaller and unicolorous, being of a pale ochreous externally, with white aperture; the normal state exhibits a purplish suffusion both externally and within, and scattered dots and maculations along the spiral liræ which surround the shell, especially prominent on the ribs of the last whorl. The whorls in all are ten to eleven, the apical being glassy and globular, the remainder are strongly longitudinally ribbed, the ribs numbering ten round the last whorl. The aperture is ovate-oblong, within purplish fuscous, in the normal examples; lip not much thickened, sinus wide, columella straight, canal shortly produced.

Mangilia chilosema †, sp. n. (Pl. I. fig. 3.)

M. testa parva, turrita, albo-straminea; anfractibus septem, quorum tribus apicalibus subvitreis, delicate sub lente striatulis, cæteris quatuor ventricosulis, apud suturas multum impressis, longitudinaliter rotundi-costatis, costis ultimo in anfractu ad undecim, undique spiraliter rudi-liratis, ad suturas et apud anfractus ultimi medium rubro-sparsis et interrupte zonatis, dorsaliter ad medium labri conspicue rubro-maculato; apertura oblonga, intus unimaculata; labro crassiusculo; sinu lato, conspicuo; columella recta; canali truncato.

Long. 6, lat. 2 mm.

Hab. Karachi and along the Mckran coast; abundant in certain localities.

Shell small, turreted, whitish straw-colour; whorls seven, inclusive of the three vitreous, obscurely delicately striate,

* *θεώηρος*, conspicuous.

† *χείλος*, lip, and *σημα*, mark.

apical, the remaining four being somewhat tumid, much impressed suturally, and longitudinally roundly ribbed; ribs eleven in number on the last whorl, the whole surface being spirally coarsely lirate; often in young specimens a gemmuled appearance is noticeable on the ribs at the point of junction with these spiral liræ, but this soon wears off. At the sutures and at the centre of the last whorl are observable red dashes and spots and a very obscure and interrupted deep red band; there is one very conspicuous and characteristic deep red spot just behind the outer lip, this being reflected within the aperture, which is oval-oblong, the outer lip being somewhat thickened, with broad and conspicuous sinus; columella straight and canal somewhat truncate.

Allied to the New Caledonian species *M. himerta* and *himerodes*, Melv. & Standen, from both of which it differs more in form than in coloration, the characteristic dorsal red spot being present in all three. In our catalogue of Madras Mollusca, Mr. Standen and I referred to this species as *M. Horneana*, Smith *, an almost equally abundant mollusk in these seas with apparently identical distribution.

Mangilia galigensis, sp. n. (Pl. I. fig. 4.)

M. testa attenuato-fusiformi, perelongata, rufo-brunnea; anfractibus novem, quorum apicali vitreo, tribus hinc approximatis rufis, unicoloribus, cæteris apud suturas compressis, ventricosulis, longitudinaliter forticostatis, costis perpauca, in ultimo septem, costis infra, juxta suturas, albescentibus, ad medium subangulatis, superficie spiraliter delicatissimo striata, eleganter vittata, albis zonis cum rufis alternata; apertura elongata; labro incrassato, nitido, perlævi, intus nigro-rufescente, extus albo-rufo vittato; canali breviter prolongata.

Long. 14.50, lat. 4 mm.

Hab. Galig Island.

The nearest, in fact the only close ally to this very beautiful form is *M. Townsendi*, Sowb. †, but the ribs are two or three fewer in number in each whorl and the colour is rufous, with no tinge of greenish; all the many examples of *M. Townsendi* I have seen are alike in both these particulars, being uniformly greenish olivaceous and many ribbed. The dimensions are about the same. I had at first thought of describing this as a varietal form only, but I defer to the opinion of two or three malacologists in keeping it distinct. *M. Townsendi* has not, so far as I am aware, been yet found

* Journ. of Conch. vol. ix. p. 38.

† Proc. Mal. Soc. Lond. vol. i. p. 278 (1895)

in the Persian Gulf; it occurs, according to Mr. Townsend, from low-water mark to 5 fathoms on muddy sand off the Mekran coast of Beluchistan.

Mangilia perlonga, sp. n. (Pl. I. fig. 5.)

M. testa multum attenuata, fusiformi, solida; anfractibus octo, inclusis duobus apicalibus vitreis, perlævis, nitidis, longitudinaliter fortiter paucicostatis, costis ultimi anfractus in numero septem, spiraliter rudi-liratis, et inter liras arctissimo tenuistriatis, liris in anfractibus supernis tribus, in penultimo quatuor, in ultimo obscurioribus, sex vel septem, apertura ovata, labro crassiusculo, sinu perobscuro, columella recta, canali brevi.

Long. 7.50, lat. 2 mm.

Hab. Karachi.

A very attenuate species, fusiform, solid, eight-whorled, inclusive of the two glassy shining apical, longitudinally strongly ribbed; ribs few, being seven on the last whorl, crossed spirally with few intersecting liræ, and between these run many fine striations. The aperture is ovate, outer lip thickened, sinus very obscure, columella straight, canal short.

Allied in form to *M. fulvocincta*, Nevill, an Indian species, but more attenuate, and with only two, as against four, vitreous apical whorls. Dimensions about the same.

*Mangilia theskeloides**, sp. n. (Pl. I. fig. 6.)

M. testa fusiformi, versus apicem attenuata, solidiuscula: anfractibus septem, apicali (in nostris specimenibus imperfecto) nigrescente, cæteris turritis, ventricosulis, lacte ochraceis, apud suturas et ad medium anfractus ultimi inter costas brunneo-zonatis, et aliter superficie omni brunneo-ochraceo sparsim depicta, costis longitudinalibus fortibus spiraliter striatis, anfractu ultimo ad undecim; apertura angusta, oblonga; labro exteriori albo, incrassato, sinu perobscuro; columella recta, apud basim brunnescente.

Long. 8, lat. 4 mm. (sp. maj.).

Hab. Karachi.

Shell fusiform, attenuate towards the apex, somewhat solid, seven-whorled, the apical whorl imperfect in all the examples examined, tinged with blackish brown; the rest of the whorls are turreted, tumid, brightly ochraceous, ornamented with strong longitudinal ribs, which number eleven on the last whorl; these are crossed by spiral close striæ, which are not shown on older worn specimens. The most conspicuous feature is a series of darker blackish-brown zones,

* *Theskeloides*, from the resemblance to *M. theskela*.

one just above the suture of each whorl and another in the centre of the lowest; these zones are interrupted and only appear between the ribs, the remainder of the surface being painted with light brown scattered dots and flames, a series of light spiral maculations just below the sutures being specially prominent. The aperture is narrow, oblong, the dark zone shows transversely across the interior. Outer lip incrassate, sinus very obscure. Columella straight, stained with brown at the base.

The three nearest species to this interesting *Mangilia* are, perhaps, *bella*, Reeve, *interrupta*, Reeve, and *theskela*, Melv. & Stand., all abundant at Lifu, the form being totally different, while in markings those of *bella* and *theskela* seem to be combined. Tryon, I may mention, unites the two former of these species; nothing could be more distinct in my opinion. I consider, too, that *M. thiasotes*, Melv. & Stand., from the Pacific Islands, comes under the same category, and cannot, as suggested recently by Mr. C. Hedley in the "Mollusca of Funafuti" *, be a *Daphnella*.

Clathurella O'Maleyi, sp. n. (Pl. I. fig. 7.)

C. testa attenuato-fusiformi, delicata, nitida, carnea; anfractibus septem, quorum duo apicales pulchre et minutissime decussati et alveolati, cæteris ad suturas impressis, tumidulis, nitidis, longitudinaliter costatis, costis paucis, apud ultimum septem, spiraliter obscure liratis, liris ad juncturam costarum magis conspicuis; apertura oblonga; labro exteriori brunneo-tincto; columella recta; canali producto.

Long. 10, lat. 3 mm.

Hab. "On shell-growth on telegraph-cable, 55 fathoms, in mud; lat. 25° 58' N., long. 57° 05' E." (Sea of Oman).—*F. W. T.*

A very delicate flesh-coloured shining Pleurotomid with oblong mouth and produced canal, seven-whorled, including two decussated apical whorls, much impressed at the sutures, longitudinally few-ribbed, there are but seven on the last whorl, and spirally obscurely lirate; the outer lip and base of the canal are tinged with brown.

I would place this species near *C. Robillardii*, Barclay, in spite of the prolonged canal. In many ways this section of the genus differs from typical *Clathurella*, but in the involved and chaotic condition of the nomenclature any arrangement is but tentative.

A few examples only, named in honour of Mr. Julian

* Mem. Austral. Mus. iii. p. 476 (1890).

Adrian O'Maley, of the Indian Government Telegraph S.S. 'Patrick Stewart,' Karachi, who has much assisted Mr. Townsend in many of his investigations.

Latirus (Peristernia) pagodaformis, sp. n.
(Pl. I. fig. 8.)

L. testa attenuata, fusiformi, fusca, ad medium costarum albescento, deinde infra spiraliter fusco-zonata; anfractibus decem, quorum tres apicales pallide brunei, vitrei, laeves, ceteris tumidis, apud suturas multum impressis, longitudinaliter rotundicostatis, costis crassis, apud ultimum anfractum decem, undique spiraliter flohratis, interstitiis arcte squamiferis; apertura ovata, intus cinerea vel pallidissime violacea; labro tenui, simplici: columella laevi, nitida, obscure et oblique quadriplicata; canali longo, paulum recurvirostri, brunneo-tincto.

Long. 28, lat. 9.50 mm.

Hab. Adhering to the telegraph-cable at 20 fathoms, mud; lat. 25° N., long. 63° E.

The nearest congener of this shell is *L. (Peristernia) pulchellus*, Reeve, of which we have seven examples, as far as this region is concerned, from Ceylon, the Angrias Bank, west of Bombay, and likewise from Muscat, where Mr. Townsend has dredged it at 10 fathoms. This new form differs in its far more tumid whorls, pinched in and compressed at the sutures, and likewise in the long, recurved, and fuscous-tinged canal; the whole spire is far more attenuate, the proportion of the last whorl as breadth is to length being 8:15, while in *L. pulchellus* it is 15:22 in a normal-sized example. *L. pagodaformis* is ten-whorled, three being pale brown, glassy, and apical; the remaining seven are tumid, longitudinally thickly and roundly ribbed, and spirally lirate; colour fuscous-brown, whitish towards the middle of each whorl, where the ribs naturally are most prominent, and on the last whorl just below this runs an indistinct spiral zone of darker brown. The aperture is oval, coloured within cinereous or very pale violet, never carnation or crimson as in *pulchellus*; the outer lip is thin and normally simple, columella obscurely and obliquely four-plaited; canal long, recurved, suffused at the base with brown.

I may add that this species seems more distinct from *L. pulchellus* than does *L. nassoides*, Reeve, though perhaps the recurved canal of the latter may constitute a specific character. Both are figured in the Conch. Icon. vol. iv., *Turbinella*, figs. 65 & 71 (1847).

Two or three examples.

Mitra (Pusia) Elizæ, sp. n. (Pl. II. fig. 2.)

M. testa utrinque attenuata, fusiformi, solidula, albescente; anfractibus 10-11, apicali nitida, perlævi, cæteris gradatulis, apud suturas impressis, arcto longitudinaliter costatis, undique spirally sulcatis, sulcis crebris, ultimo in anfractu 13, penultimo 4-5, ad juncturam costarum summam ochraceo-punctatis vel lineatis, interstitiis aliter lævibus; anfractibus superne juxta suturas, et in ultimo, apud medium fusco-cinctis, ad basim paullum nodulifero; apertura oblonga, fuscescente; labro recto, extus ad partem inferam crenulato; columella ochraceo-tincta, quadruplicata.

Long. 18, lat. 6.50 mm.

Hab. In coral-sand, dredged at 10 fathoms, Sheik Shuaib Island, Persian Gulf.

Two fine examples of a *Pusia* of elegant fusiform contour, attenuate at both ends, somewhat solid, white, ten- to eleven-whorled, the apical being shining, smooth, the remainder gradate and compressed at the sutures, smooth, closely ribbed, and spirally crossed by many revolving sulci, these being orange-dotted or lineated at the point of junction with the centre of each rib. Obscurely at the sutures, but very distinctly in the centre of the last whorl, run spiral fuscous zones; this latter shades off gradually towards the base; the aperture is oblong, fuscous; outer lip straight, crenulate in its lower part; columella tinged with ochre, four times plaited.

Allied to *M. infausta*, Reeve, from Ticao, and *M. fulvo-sulcata*, Melv., from Mauritius and Lifu. Neither of these species, however, has the fusiform contour nor any sign of the brown central fascia, though agreeing in the ochreous spiral sulci.

Mitra (Costellaria) revelata, sp. n.
(Pl. II. figs. 3, 3 a.)

M. testa turriculata, fusiformi, albida, parum nitente, solidiuscula; anfractibus 10-11, apicalibus sæpe puniceo-tinctis, cæteris gradatulis, superne arcte longitudinaliter costatis, costis lævibus, obtusis, ultimo in anfractu, præcipue dorsaliter, plerumque fere evanidis, superficie longitudinaliter tenuiter brunneo-lineata, apud medium obscure brunneo-zonulata; apertura oblonga, alba; labro exteriore recto, crassiusculo; columella quadruplicata.

Long. 21, lat. 8 mm.

Hab. Sheik Shuaib Island, 7-20 fathoms, in sand and mud; in 10-15 fathoms off Kais (or Gais) Island, in shingle and dead coral, Persian Gulf.

A species apparently common, though local, in the Persian Gulf, and probably extending in both a southerly and eastward direction. It has hitherto been confounded with *M. pacifica*, Reeve, of which I possess an original type from the collection of the late Sir D. Barclay, Bart., the example figured in Sowb. Thes. Conch. t. ccclxxviii. fig. 630, which exhibits a form more compressed, strongly shouldered, and angulate in the upper portion of each whorl, very rugose, and ribs fewer but more marked in proportion. I consider this latter species nearer to the variable *M. cadaverosa*, Reeve, so abundant in the Philippines, and especially the islands of the Pacific. *M. Wisemanni*, Dohrn, is in size nearer our shell, but the clearly defined and frequent longitudinal ribs, unvarying in all the specimens I have seen, amply distinguish it. I am much indebted to Mr. Sowerby for especially calling my attention to this hitherto neglected species.

Erato olivaria, sp. n. (Pl. I. fig. 9.)

E. testa arcuato-pyramidata, solida, læte olivacea, apice subconico; anfractibus quatuor, supernis interdum rugosulis, interdum lævibus, ultimo anfractu lævi, rapide accrescente, tumidulo, pyriformi, apud basim paululum attenuato; apertura angusta, oblonga; labro exteriori crassiusculo, denticulis quindecim intus prædito, margine columellari, et præcipue versus basim, incrassato, denticulato.

Long. 6, lat. 3.25 mm.

Hab. Karachi.

A few examples of a somewhat solid smoothish *Erato*, conspicuous for its bright olive hue; the apex is subconical; whorls four, the last being large, pyriform, somewhat attenuate at the base, the mouth narrowly oblong; outer lip thickened, denticulate within, with fifteen little teeth; columellar margin thickened, especially towards the base, and then also denticled. This species slightly resembles the European *E. lævis*, Donovan.

The only other known smooth species of a uniform green or olive hue is *E. prayensis*, Rochbrune, from the Cape Verd Islands, but, from description, would seem to differ both in form and lip-characters.

Natica Ponsonbyi, sp. n. (Pl. II. fig. 4.)

N. testa globosa, anguste sed profunde umbilicata, solida, lævi, paululum nitida, albida; anfractibus 4-5, apicali fere immerso, nigro, cæteris supra suturas castaneo-fasciatis, ultimo anfractu

binis fasciis decorato; apertura ovata; labro simplici, paulum incrassato; columella nitida, alba, callosa, apud umbilicum excavata; operculo late concentricè sulcato.

Long. 17, lat. 16 mm. (sp. maj.).

Hab. Persian Gulf (Ponsonby, in Mus. Brit.); Karachi (F. W. T.).

Belonging to the typical—*Eunatica*—section of the genus, as characterized by the calcareous and more or less sulcate operculum, this species bears a superficial resemblance both in pattern and colour of fasciation to *N. spadicea*, Gmel., or *rufa*, Born, but is far more rotund and compact than either. The large example figured was not dredged by Mr. Townsend, all his specimens, though alike in other respects, being much smaller and probably not fully grown; but it was presented to our National Collection some years ago, with the locality "Persian Gulf," by Mr. John H. Ponsonby, to whom I have the great satisfaction of dedicating so interesting and beautiful a species.

*Scalaria (Cirsotrema) hidryma**, sp. n.
(Pl. I. fig. 10.)

S. testa attenuato-fusiformi, solidiuscula, ochraceo-fusca; anfractibus apud suturas impressis, fuscis, apicalibus 7, cæteris, in numero septem, longitudinaliter crassicostatis, costis rectis, novem in ultimo et penultimo anfractu, spiraliter undique leniter striatis, ultimo versus basim subangulato, incrassato, rugoso-lirato, fuscescente; apertura rotunda; peristomate continuo, percrasso, fusco, radiatim striato.

Long. 8, lat. 3 mm.

Hab. Karachi.

A well-marked *Cirsotrema* allied to *S. bicarinata*, Sowb., *attenuata*, Pease, and *crassilabrum*, Sowb.; perhaps most nearly to the last-named species, from which it differs in its sutures being not so deeply impressed, thicker and more conspicuous ribbing, much less angled more attenuate form, the continuous, fuscous, radiately striated peristome being similar.

Scalaria (Constantia) Standeni, sp. n.
(Pl. I. fig. 11.)

S. testa parva, fusiformi, fuscata; anfractibus octo, quorum tribus albis, vitreis, fere lævibus, cæteris ventricosis, apud suturas impressis, arctissime decussatis, interstitiis exacte quadratis, ultimi

* *Ἰδρυμα*, a beautiful habitation.

anfractus costulis longitudinalibus circa duo et quadraginta, spiralibus octodecim; apertura rotunda; peristomate fere continuo, paulum incrassato, albescente.

Long. 4.50, lat. 2 mm.

Hab. Karachi.

A small but highly chased *Constantia*, of about the same dimensions as *jucunda*, Adams, from Corea, but with rounder peristome, eight instead of six whorls, and with last whorl more ventricose and not produced basally. The colour is fuscous; the three apical whorls are almost smooth, shining, vitreous, the remaining five all ventricose, impressed at the sutures, and very closely decussate, with many small longitudinal riblets, crossed spirally by others of the same nature and consistency, leaving minute quadrate interstices between them at the point of junction. The peristome is almost continuous, whitish, slightly incrassate, aperture round. Several examples, some of which (which have come to hand since the original description was framed) are lighter in colour but otherwise identical.

I do not consider *Constantia* more than subgeneric. I have much pleasure in associating this little shell with the name of Mr. Robert Standen, Assistant Curator of the Manchester Museum, who is about to collaborate with me in drawing up a complete catalogue of Mr. Townsend's large collections of Mollusca from the Indian Ocean.

Actæopyramis Psyche, sp. n. (Pl. I. fig. 13.)

A. testa attenuato-fusiformi, perlonga, tenui, subpellucida, albido-straminea; anfractibus decem, apud suturas gradatulis, apicali heterostropho, levi, globulari, cæteris arcte sulcatis, sulcis pulchre punctulatis, ultimo anfractu fero recto, attenuato; apertura anguste ovata, labro tenui, margine columellari obscurissime uniplicato.

Long. 16.50, lat. 3.50 mm.

Hab. Karachi.

A most delicate semitranslucent shell, to which the specific name chosen seems very fitting. It is akin doubtless to *A. fulva*, better, perhaps, known as *Monoptygma fulva*, A. Ad.; but this name of Gray's (1840) must become a synonym, as Lea had previously used it in 1835 for a subgenus of *Ancilla*, Lam. From this, however, it differs in several salient particulars—firstly, in the paler attenuation and straightness of whorl; secondly, in possessing two more whorls; thirdly, in the last whorl not being the least shouldered at the periphery; fourthly, in the whitish and

subpellucid consistency; and, lastly, in the close and fine punctuation of the interstices, *A. fulva*, Ad., having sulci quite plain and smooth throughout.

Odostomia eutropia *, sp. n. (Pl. I. fig. 14.)

O. testa ovato- vel oblongo-fusiformi, candida, perlævi, nitida; anfractibus 6-7, apicali heterostropho, lacteo, bulbiformi, cæteris profunde ad suturas canaliculatis, paullum gravatis, nequaquam ventricosus, ultimo spiralliter ad peripheriam unicarinato, aliter lævissimo; apertura ovata, intus spirali-striata; labro vix, præter ad basim, incrassato; columella fortiter uniplicata.

Long. 5, lat. 2 mm. (sp. maj.).

„ 3, „ 1.25 mm. (sp. min.).

Hab. Karachi; also in mud at 25 fathoms, lat. 26° 23' N., long. 54° 53' E.

Shell either ovate or oblong-fusiform, bright shining white; whorls six or seven, the apical being heterostrophous, milky white and bulbous; the remainder are deeply canaliculate at the sutures, slightly turreted, but not in the least swollen; the last whorl at the periphery is once sharply carinate (in one or two specimens the keel is not so plainly seen); the aperture is oval, within spirally striate, the outer lip is hardly thickened except towards the base, the columella being more strongly plaited.

This is the species mentioned (Proc. Mal. Soc. vol. ii. p. 113) as having been noticed at Bombay, and descriptions drawn up, when the specimens unfortunately got mislaid, naturally therefore precluding publication. Many examples have been found at Karachi by Mr. Townsend, showing some variety in both size and distinctness of peripheral carination. *O. carinata*, A. Ad. (Proc. Zool. Soc. 1873, pl. xxiii. fig. 4), has also occurred in the same locality; it is conspicuous for a thickening below the sutures, thus forming a double angle to each whorl. It does not seem a monstrosity.

Pyrgulina epentromidea, sp. n. (Pl. I. fig. 15.)

P. testa ovata, crystallina, tenui, apice heterostropho, pervitreo, lævi; anfractibus quinque, gradatis, apud suturas multum impressis, undique longitudinaliter costatis, costis delicatis, vitreis, interstitiis lævibus, ultimo anfractu costis ad basim imam conspicuis, labro tenui; apertura ovata, intus striatula; columella fortiter uniplicata.

Long. 2, lat. 1.30 mm.

* *εὖ, ῥηδνῆς*, with conspicuous angle or keel.

Hab. At 25 fathoms, in mud, lat. $26^{\circ} 23' N.$, long. $54^{\circ} 53' E.$

Remarkably delicate and subpellucid in form, this species, with the important exception of the strong columellar plait, recalls *Rissoina epentroma*, Melv. The interstices between the ribs are plain and smooth, in which respect it differs from most of its congeners. The apical whorl is heterostrophe, white, vitreous, smooth and bulbiform; the remaining four whorls are all uniformly delicately straight-ribbed, and are much impressed suturally, thus assuming a gradate appearance. The mouth is ovate, within spirally striate; columella with one central strong plait.

Pyrgulina glycisma *, sp. n. (Pl. I. fig. 16.)

P. testa ovata, candida, compressa, apice globulari, lævi, heterostropho; anfractibus (apicalibus $1\frac{1}{2}$ inclusis) $6\frac{1}{2}$, ad suturas impressis, paullum gradatis, longitudinaliter acute obliquicostatis, costis lævibus, crassiusculis, nitidis, interstitiis delicato spiralliter striatis, ultimo anfractu ad peripheriam spiralliter profunde canaliculato et radiatim costulato; apertura ovata; labro simplici, paullum incrassato; columella uniplicata.

Long. 3, lat. 1.25 mm.

Hab. Karachi.

Only a few examples occurred of this small but characteristic species. Mingled with it, but both in far greater plenty, were two having a superficial resemblance to it, viz. *Pyrgulina callista*, Melv., which, originally described from Bombay †, attains at Karachi a far finer condition and size, and *Rissoina epentroma*, Melv., likewise first reported ‡ from the same place.

The shell is ovate, pure white, sometimes with a cinereous tinge; apical whorls $1\frac{1}{2}$, heterostrophe, smooth, globular; the remaining whorls, 5 in number, are uniformly closely obliquely ribbed, these being shining, smooth, and somewhat thickened, with the interstices spirally striate; the sutures are impressed, causing the spire to appear slightly gradate; the ribs of the last whorl amount to 24. Aperture is ovate, outer lip only slightly thickened, columella once plaited. At the periphery of the last whorl is a deep spiral channelled groove, with a revolving rib at its margin.

This species has as its nearest congeners *P. turbonilloides*,

* γλύκισμα, a delicacy.

† Mem. Lit. & Phil. Soc. Manch. ser. 4, vol. vii. p. 9, pl. i. fig. 13

‡ Proc. Mal. Soc. vol. ii. p. 110, pl. viii. fig. 23 (1896).

Brusina, from the Mediterranean, *P. monocycla*, A. Ad., from Japan, and *P. callista*, Melv., from the Indian Ocean. Very recently (1898) Prof. Ralph Tate has described *P. Mayii** from Tasmania, which by the figure must be close to, if not actually identical with, *P. callista*.

Lacuna tenuistriata, sp. n. (Pl. II. fig. 5.)

L. testa ovato-orbiculari, pallide straminea, versus apicem puniceo-suffusa, tenui, anguste umbilicata; anfractibus quatuor, apicali incluso subpapillari, lævi, tumidulis, apud suturas impressis, arcuissime spiralliter tenuistriatis, ultimo rapide accrescente, effuso; apertura lunari, labro exteriori tenui, paululum effuso; margine columellari apud basim crassiusculo, nitido, albo, apud umbilicum canaliculato.

Long. 15, lat. 10 mm.

Hab. Muscat, Persian Gulf, at 7 fathoms.

A most interesting addition to the genus, from the known species of which it differs in greater tenuity, ovate-orbicular form, flattened apex, lowest whorl roundly effuse, the whole surface being most closely and finely spirally striate. Mouth lunar; outer lip thin; columella slightly thickened towards the base, white, shining, canaliculately grooved in the region of the narrow umbilicus. *L. indica*, E. A. Smith, is the only other true *Lacuna* hitherto recorded from tropical seas.

Prietrochus sepulchralis, sp. n. (Pl. II. fig. 6.)

P. testa semiglobosa, anguste umbilicata, gradatula, solida, alba, ochraceo-straminea vel, rare, puniceo-variegata; anfractibus quinque, apicali acuminato, lævi, cæteris gradatis, spiralliter flo-costatis, costulis acutis, ultimo et penultimo infra suturas spiralliter angulatim coronatis; apertura obliqua, rotunda, intus arcte sulcata; labro exteriori effuso, crassiusculo; margine columellari incrassato, albo, nitente.

Alt. 11, lat. 10, diam. 10 mm.

Hab. Kais Island, 9 fathoms, coral-sand.

Several examples, some subfossil. Semiglobular in form, with turreted whorls, the last two possessing, just below the sutures, a spiral coronation of nodules; the apical whorl is smooth, the remainder being spirally acutely costulate to the base of the last whorl. The aperture is obliquely rounded, within sulcate; outer lip thick, somewhat effuse; columellar margin thickened, especially in the proximity of the narrow umbilicus.

* Trans. Roy. Soc. S. Australia, 1898, p. 84, pl. iv. fig. 6.

Maetrinula tryphera *, sp. n. (Pl. II. fig. 7.)

M. testa pertenui, subpellucida, lactea, late trigonali; umbonibus fere centralibus, prominulis, acutis; margine dorsali antice paululum excavato, deinde versus marginem ventralem leniter rotundato; postice breviter extenso, longitudinaliter carinato; margine ventrali versus latus posticum sinuato, aliter fere recto; superficie externa omnino usque ad carinam posticam regulariter concentricè laminata; laminis circa sex et viginti, intus pagina pellucida, laminas externas exhibente; dentibus cardinalibus et lateralibus parvis, contiguis.

Alt. 14, lat. 22, diam. 7 mm.

Hab. Hinderabi Island, at 35 fathoms, mud.

Shell very thin, milky-vitreous, subpellucid, broadly trigonal, anteriorly slightly gaping; the umbones are almost central, inclining forwards, acute, and prominent; the anterior portion of the dorsal margin is excavate and at length gently rounding off towards the ventral margin. Posteriorly the margin (dorsal) is shortly extended, longitudinally once-carinate; the ventral margin is mostly straight, but sinuous where joined by the carina; the external surface of the shell is uniformly and regularly concentrically laminate, with the exception of the posterior space enclosed by the keel, which is smooth; the laminæ are some six-and-twenty in number, inclusive of those on the umbones, which are small and obscure. Within the surface is pellucid, showing through the external laminæ; the teeth, both cardinal and lateral, are small and near each other. Pallial sinus obscure, hardly perceptible.

This is a very beautiful and delicate little mollusk, having some resemblance to the larger and coarser *M. plicataria*, L.; but the form is more regularly trigonal, and the umbones more central, with the anterior dorsal margin less prominently excavate and the concentric laminæ closer and finer.

While discussing a member of the Mactracea, I should like to take the opportunity of stating that further examination of a species described by me as *Petricola lyra*, from Commander Shopland's Aden collections †, prompts me to the decision that it is really a *Standella* akin to *S. Solandri*, Gray. The Mactride of this alliance have a strong superficial resemblance to *Petricolas*, and the teeth of this new form were rather distorted and compressed, thus causing

* τρύφερος, delicate.

† Ann. & Mag. Nat. Hist. ser. 7, vol. i. p. 204.

confusion. It has been placed by Mr. Edgar Smith in the National Collection as *Standella lyra*, Melv., in direct sequence with *S. Solandri*, Gray.

Lucina (Coulakia) angela, sp. n.

(Pl. II. fig. 8.)

L. testa parva, orbiculari, albo-calcareo, fere æquilaterali; umbonibus contiguis, prominulis, margine dorsali antice paullum excavato, deinde leniter rotundato per marginem ventralem usque ad latus posticum; superficie externa longitudinaliter tenuicostata; costis ad quinquaginta, delicate imbricatis, oblique arcuatis, concentricè irregulariter plicata; costis trans medium versus latus anticum pulchre divaricatis, ligamento vix externo; pagina interna subpellucente, albida, nitida; margine undique pulchre crenulato; dentibus in utraque valva cardinalibus, simul ac lateralibus, duobus; impressione palliali conspicua, laud sinuosa.

Alt. 8, lat. 9, diam. 4 mm.

Hab. Gwadar, on hard sandy mud, dredged at 8 fathoms.

Allied to *L. fibula*, Ad. & Rve., and *pecten*, Lam., this little species differs from both in form and the character of the divaricating ribs. The form is more truly orbicular and almost equilateral. The umbones are prominent, contiguous, and inclined anteriorly, on which side the dorsal margin is slightly excavate, but soon rounds off towards the ventral margin and forms an almost complete circle. The divaricating ribs are slightly beyond the centre of the surface and towards the anterior side; the total number of ribs is about fifty, they are close and finely imbricate; the shell is rudely and irregularly, here and there concentrically, plaited. Within, the surface is white, shining, subpellucid, the whole rounded margin is finely crenulate; each valve possesses two lateral and two cardinal teeth, and the pallial impression is entire and conspicuous. The ligament appears in part concealed by the valve-margin.

Several examples.

Cryptodon victorialis, sp. n. (Pl. II. figs. 9, 9 a.)

O. testa delicata, albo-lactea, ovato-orbiculari, æquivalvi, paullum inæquilaterali, undique concentricè pulcherrime lamellata; lamellis teneris, arcatis, apud umbones sæpe evanidis, in numero circa sexaginta; umbonibus contiguis, antice inversis, latere postico longitudinaliter obliquiplicato, antice lunula distincta ad marginem serrata, excavata; superficie sub lente hic illic pellucide punctata; dente cardinali valvæ dextræ magno, conspicuo; pagina intus lactea, vix nitente, punctis pellucidis nitidis et striis longitudinalibus notata; linea palliali completa.

Alt. 24, lat. 24, diam. 14 (sp. maj.).

Hab. Near Karachi and also Malcolm Inlet, Persian Gulf, 24 fathoms.

A remarkably delicate, semitransparent, milky-white shell, slightly inæquilateral, entirely concentrically laminated with about sixty close-lying ridges; these are very thin and worn off, as a rule, towards the umbones; these last are contiguous, curving anteriorly; there is a longitudinal oblique conspicuous fold or groove, extending posteriorly from the umbo to the hinder extremity, and likewise in front; a distinct lunule; the dorsal margin of the shell is serrate or fimbriolate; in juvenile examples the lamellæ are more sparse and distant, but the serrations are conspicuous and seem to extend far down both sides almost to the ventral margin. As is the case with several allies, e. g. *L. pennsylvanica*, L., *L. jamaicensis*, Lamk., small pellucid raised dots are noticeable with a lens on holding up a specimen to the light.

Several examples, but mostly single valves, only one being quite perfect, and that in young condition, with fewer concentric lamellæ (fig. 9 a).

Diplodonta holosphæra *, sp. n. (Pl. II. fig. 11.)

D. testa rotundato-circulari, alba, parum nitida, plana, tumida, æquivalvi, ut proxime æquilaterali; umbonibus contignis, margine dorsali antice paullulum excavato, postice leniter obliquo, deinde omnino rotundato, ligamento externo; valva sinistra duobus dentibus cardinalibus approximatis, dextra duobus, postico bifido; superficie intus alba, pellucente; linea palliali simplici.

Alt. 8, lat. 8.50, diam. 7.50 mm.

Hab. At very low tides, Karachi; also imbedded in rocks at 40 fathoms, lat. 27° N., long. 52° E., Persian Gulf.

A few examples of an almost circular spheroid *Diplodonta*; valves as nearly as possible equilateral, the umbones contiguous, ligament external, margin on either side of the umbones very slightly excavate anteriorly, obliquely straight posteriorly for a short distance, then completely round; the body of the shell very tumid; there are in either valve two teeth, those of the left valve are closely approximate, the pallial line being simple.

Scintilla callipareia †, sp. n. (Pl. II. fig. 10.)

S. testa vitrea, delicata, oblongo-ovata, æquivalvi, semiclausula, fere æquilaterali, nitida, lævi, pallide rosea; umbonibus contignis,

* ὅλος, complete, σφαῖρα, a globe.

† καλλίπαρος, beautiful cheeked.

prominulis, margine dorsali utrinque fere aequali, leniter in ventralem immergente; ligamento interno, hujus valvæ dente cardinali conspicuo, prolongato, illæ duobus minoribus approximatis, dento laterali juxta cardinem abbreviato, pagina intus translucida; impressione palliali integra.

Alt. 9, lat. 14, diam. 4.50 mm.

Hab. Telegraph-cable, lat. 27° N., long. 52° E., at 40 fathoms, Persian Gulf.

A very delicate mollusk, allied to *S. rosea*, Desh. It is very translucent, shining, of the palest blush reflection, oblong-ovate in form, equivalve and almost equilateral, and quite smooth. The umbones are fairly prominent, close together; dorsal margin continuous, and almost equal posteriorly and anteriorly, gently merging into the ventral margin. Valves almost closed in repose; the ligament is internal, the cardinal tooth prolonged and conspicuous, the fellow valve possessing two smaller teeth; the lateral tooth is short, placed near the hinge; the inner surface being plain, transparent; pallial impression entire.

? *Edalina asiatica*, sp. n. (Pl. II. fig. 12.)

Æ. testa delicatula, nitida, alba, æquivalvi, inæquilaterali; umbonibus prominulis, contiguis; margine dorsali antice paulum excavato, deinde leniter rotundato ad marginem ventralem, latere postico paulum producto, oblongato; superficie nitida, hic illic depressiuscula, concentricè rudistriata; ligamento externo; dentibus dextræ valvæ tribus, sinistræ duobus cardinalibus, haud tamen bifidis, lateralibus nullis; pagina interna subpellucida; linea palliali multum sinuosa.

Alt. 12, lat. 16, diam. 8 mm. (sp. maj.).

Hab. Muscat, at 10 fathoms; also smaller examples at Charbar, Mekran coast, at 3-7 fathoms.

I feel some doubt as to the correct generic designation for this shell. It is in shape externally much like *Edalina subdiaphana*, Carp., from California, and Mr. Edgar Smith suggested in consequence that it might be possibly located with it. The teeth, very small and difficult to pronounce upon, seem to agree to a great extent with those of the western *Edalina*, but I do not notice that any of them are bifid. Carpenter separated *Cooperella* from *Edalina* on account of this peculiarity alone. If this species be an *Edalina*, it would tend to show greater affinity with the Scrobicularinæ than the Tellinidæ, the texture of the shell, though thin, being coarse, here and there irregularly depressed and roughly concentrically striate. It is equivalve,

inæquilateral, umbones prominent, oblong in form, being somewhat produced posteriorly; the ligament is external; teeth in right valve apparently three, in the left two, all cardinal; inner surface subpellucid, white; pallial line with a conspicuous sinuosity.

Several examples, but only a very few in mature condition.

EXPLANATION OF THE PLATES.

PLATE I.

- Fig. 1. *Naesa (Hima) ischna*.
- Fig. 2. *Drillia theoreta*.
- Fig. 3. *Mangilia chilosema*.
- Fig. 4. — *galigensis*.
- Fig. 5. — *perlonga*.
- Fig. 6. — *theskelmides*.
- Fig. 7. *Clathurella O'Maleyi*.
- Fig. 8. *Latirus (Peristernia) pagodaformis*.
- Fig. 9. *Erato olivaria*.
- Fig. 10. *Scalaria (Cirsotrema) hidryma*.
- Fig. 11. — (*Constantia*) *Standni*.
- Fig. 12. *Cerithiopsis (Scila) bandorensis*, Melv.
- Fig. 13. *Actæopyramis Psyche*.
- Fig. 14. *Odostomia eutropia*.
- Fig. 15. *Pyrgulina epentromidea*.
- Fig. 16. — *glycisma*.

PLATE II.

- Fig. 1. *Fusus Townsendi*.
- Fig. 2. *Mitra (Pusia) Eliza*.
- Figs. 3, 3 a. *Mitra (Costellaria) revolata*.
- Fig. 4. *Natica Pons-nbyi*.
- Fig. 5. *Lucina tenuistrata*.
- Fig. 6. *Prætrochus sepulchralis*.
- Fig. 7. *Maetrinula tryphera*.
- Fig. 8. *Lucina (Cudakia) angela*.
- Figs. 9, 9 a. *Cryptodon victorialis*.
- Fig. 10. *Scintilla calliparcia*.
- Fig. 11. *Diplodonta holosphæra*.
- Fig. 12. ? *Edalina asiatica*.

VI.—Observations on the Classification of Birds.

By Dr. R. W. SHUFELDT*.

IN former papers of mine the classification of various groups of birds has been treated, their osteology, as a rule, being the anatomical system employed and referred to for the purpose.

* From the 'Proceedings of the Academy of Natural Sciences of Philadelphia,' 1898, pp. 480-499. Read by title at the Sixteenth Congress of the American Ornithologists' Union, at the United States National Museum, Washington, D.C., 17th November, 1898.

These investigations, as many are aware, have not been confined entirely to recent avifaunæ, but have also taken into consideration fossil material, the remains of birds that existed as far back as Tertiary time.

So far as the United States ornithology is concerned, every family, or, indeed, nearly every genus of the recent age, has thus been dealt with, and some of the MSS. presenting the details of these researches have been published, while the far greater proportion of them temporarily await a similar disposition. It is in this manner that such groups as the Passeres, the Swifts, the Humming-birds, the Goatsuckers, the Trogons, the Kingfishers, and many others have been gone over and issued in the form of memoirs in different publications, while upon the other hand the osteology of entire groups has been written out and illustrated, and will, when printed, fill in gaps that formerly existed. Among these last, extensive work has also been done with large and small groups of birds not occurring in this country, as the Penguins, the Ostriches, and others. These will not be taken especially into consideration in the present connexion, for the reason that considerable unanimity of opinion exists among naturalists with respect to their taxonomy; though probably the Penguins form an exception to this statement. Commencing in the United States avifauna with the Pygopodes, however, and passing the various groups in review, following their linear arrangement in the order in which they are usually printed, we meet not only with single species but with groups of species, as to the true taxonomic position of which in the system ornithologists entertain very diverse opinions. It is to these that it is my intention to refer in the present paper. They have all been closely studied osteologically, and in the case of many of them their general anatomy has been investigated and their biology as a whole given weight. My views upon the classification and systematic position of some of these families or species now in my mind have been briefly abstracted and published either in 'The Ibis' of the British Ornithologists' Union or in the 'Proceedings' of the Zoological Society of London. Others there are that have not been so noticed.

Prior to passing to the aforesaid subject-matter in chief, however, it may be as well first to pay some attention to the morphological characters of birds, with special reference to their use in determining a scheme for the natural classification of the class. By the natural classification of Aves is meant an orderly arrangement of existing birds into major and minor subdivisions according to their true affinities as they actually obtain in nature. That a real relationship exists among

certain and various tribes of birds, since the time they have, through their evolution, become differentiated from their remote reptilian stock, is a fact that it is feared those who attempt their taxonomy do not always keep impressed with sufficient strength upon their minds. Consequently we often hear of this classifier's arrangement, and that classifier's arrangement or scheme, just as though no real affinities existed, whereas it is the duty of each and every one attempting a taxonomic scheme to discover precisely how the avian tree has thrown out its branches and its twigs, and, if possible, determine the points from where they sprung. Equally useless is it to attempt a classification of birds by selecting for the purpose the ornith of any particular area of the earth's surface. Those that enter upon the task by applying to taxonomic ornithology the birds occurring within arbitrary political boundaries as mapped out by man will fail utterly, and such a piecemeal provisional classification will, with the greatest certainty, be broken up the moment the first far-seeing taxonomer tests it with the morphological facts gathered from the entire class, both existing and extinct, as far as they are known to science. For this reason we must consider all the classifications of birds up to the present time as being merely provisional, inasmuch as we are yet so far from possessing the necessary knowledge to define the true one, based upon the complete biological history of the class. A study of the various classificatory schemes that have been presented within the last twenty-three centuries will convince any one that there has been just as much of an evolution in this field as there has been in the case of birds themselves. It must be remembered in this connexion that even as early as Aristotelian time birds were classified into groups, and Pliny, adhering to much that had been done five centuries before him, selected only the very obvious characters of the feet for the purpose, which threw all the birds known to him into three divisions, of which a Hawk, a Hen, and a Goose were respectively representative. Thus were associated the Ducks and Cormorants, the Rails and Robins—and this is what the feet did. Ornithology was placed upon a scientific basis about the middle of the seventeenth century through the labours of Willughby and Ray. They were the first to use the two main divisions of Land- and Water-birds, and in subdividing both the bills and feet were used as classificatory characters. For the most part Linnæus followed Ray, and in doing so kept many birds in taxonomic juxtaposition where the affinity was quite remote. Mergansers and Albatrosses were kept together, as were Divers and Gulls—and so much for what bills and feet

did in those days. Improvement over early authors was very evident, however, and many palpable errors were rectified. From such beginnings the science has grown up, authors and classifiers being more and more numerous with each succeeding generation. Some used one set of characters and some another; but it is to be distinctly noticed that the previous taxonomic schemes have always influenced their followers in later years. Merrem, who in 1812 was perhaps the first to publish a systematic arrangement of the groups of birds, was doubtless influenced by all that had been accomplished prior to his time, as the work of Nitzsch in pterylography, Cuvier in structure, and Linnæus and Ray in a number of external characters. His scheme was a solid contribution to the classification of birds, based as it was upon a variety of anatomical characters, as those drawn from the sternum, those from the feathers, those from the osseous system, and those from other parts, as the bills and feet. In fact Merrem took a long step in the direction of the truth, or, rather, in the discovery of the true relationships of birds in nature.

De Blainville quickly followed Merrem, and again rearranged the avian scheme of classification, fascinated as he was by the characters presented on the part of the body of the sternum. In some directions further advancement was evidenced, however, and this advancement later on was powerfully increased by the labours of Nitzsch, who brought into play the arterial system, the song-muscles, the nasal glands, and other morphological features.

Thus, from the time of Nitzsch down to the present day the classification of birds has gone through many changes and many phases at the hands of the ornithologists of the succeeding generations as they have passed. The greatest advances have been made since the scientific demonstration of the law of organic evolution and the derivation of birds became known, and these by the men who have studied the subject from that standpoint. Were it possible for us now to know the complete biology of every bird-form that has existed upon the earth since birds as birds came into existence, there would be among ornithologists an agreement of opinion upon their classification, the world over, within a twelvemonth. If half the species that have existed were known, the scheme would almost work itself out. As it is, we probably see to-day in the world's avifauna but a paltry remnant of that enormous and unknown host, and it will be generations yet to come ere there will be a consensus of opinion upon the affinities of this puzzling and very homogeneous group of vertebrates. When compared with other major groups of animals, either verte-

brate or invertebrate, the structural differences to be found among the forms making up the natural minor groups of existing birds are far less apparent than in any one of them. Taken in their entireties, the difference between an Apteryx and a Humming-bird morphologically is not to be compared with what exists, when thus contrasted, between such forms, for example, as a man and an *Ornithorhynchus* among mammals, or between a Lancelet and a Bass among fishes. Birds are an extremely compact group, and the disposition is altogether too prevalent, in attempts to classify them, to accord too high a rank to not a few of the divisions above the family. Were birds fishes the entire congregation of them would hardly make more than a respectable order. They are a lucky lot of closely affined volant feathered reptiles that have specifically multiplied at a wonderful rate since they sprang into existence, and useful and charming as the majority of them are in nature, their taxonomy nevertheless has puzzled the wits of many a man since Aristotle lived, and will doubtless continue to do so in the years to come. To arrive at their true affinities and a natural grouping of the class it will be necessary to utilize every fact that we possess in regard to their biology; by this it is meant every palæontological fact, every fact referring to geographical distribution for all time, every morphological fact, besides all that is known of their biology, habits, and development. In so far as their anatomy is concerned, some of the systems have undoubtedly proved to be of more value than others in the matter of classification. For example, in this particular the study of the skeleton teaches us more than a comparison of the dermal appendages, but the osseous system is by no means all-sufficient to meet the ends of taxonomy, as some still seem to believe. With regard to this, it is easy to agree with what Professor Alfred Newton has said, when commenting upon the value of the work left us by Nitzsch, for "there can be no part of a bird's organization that by proper study would not help to supply some means of solving the great question of its affinities. This seems to the present writer to be one of the most certain general truths in zoology, and is probably admitted in theory to be so by most zoologists, but their practice is opposed to it; for, whatever group of animals be studied, it is found that one set or another of characters is the chief or favourite of the authors consulted—each generally taking a separate set, and that to the exclusion of all others, instead of effecting a combination of all the sets and taking the aggregate." Thus it is that, notwithstanding the relative value of the characters furnished on the part of any particular

morphological system, as indicating interexisting affinities, that value is certain to be affected when the facts brought out by a study of another system, as the muscular system, for example, are applied to it. As evident as this is, however, we have not far to seek in order to discover avian classifiers who would be content to base their taxonomic scheme of the class upon some single character of some special system, as, for instance, De Blainville did in using only the body of the sternum for the purpose. Such a practice lands one not very far from the plane arrived at by Pliny in the first century.

Dr. Alfred Russel Wallace, in criticizing a memoir of Mr. Blanchard's in 'The Ibis' for the year 1864, says very truly that we should make the greatest errors in classification by following the sternum alone, as, "for example, the sterna of the Finches and the Flycatchers are scarcely distinguishable, notwithstanding the great dissimilarity in almost every part of the structure of these birds—their bills, their feet, their plumage, their habits, food, and digestive organs. On the other hand, the sterna of the several genera of the *Caprimulgidae* differ from each other more than those of the most distinct families of the restricted *Passeres*. The Bee-eaters, the Barbets, and the Woodpeckers, again, are three very distinct families, which, in a classification founded upon all parts of a bird's organization, cannot be brought in close contact; and yet their sterna, according to Mr. Blanchard, much resemble each other. It is evident, therefore, that the whole structure of a bird and its corresponding habits may be profoundly modified, and yet the sternum [may retain a very close resemblance to a common form; and, on the other hand, the sternum] * may undergo important changes, while the general organization and habits are but little altered." So much for the value of single anatomical systems in avian taxonomy, and so much for the value of single characters in any system. Now as to the value of osteology as a whole in the classification of birds, no ornithologist or classifier of this group of vertebrates will for a moment doubt. Employed in its entirety the osseous system of Aves stands far in advance of any other in settling the question of affinities and affording characters in classification. It has been almost entirely through our studies of the fossil skeletons of birds that we have been enabled to fix their origin in time or to link them with their extinct reptilian ancestors.

* [The passage between brackets is as it stands in 'Ibis,' and has probably been omitted by accident in the *Proc. Ac. Nat. Sc. Phil.*—Eds.]

The researches of the Parkers in the development of the embryological skeleton of birds; of Huxley in the skull; and the labours of Macgillivray, Nitzsch, Merrem, De Blainville, L'Herminier, Cuvier, St.-Hilaire, Gervais, Blanchard, Eyton, Owen, Garrod, Forbes, Fürbringer, Gadow, Lucas, Beddard, and many others upon the general skeleton; with the study of palæontological osteology by Milne-Edwards, Cope, Marsh, and their colleagues in the same field, would, when taken in the aggregate, go far toward establishing a natural classification, or, rather, toward indicating the true affinities of birds.

Still, in face of all this, we must believe that osteology is by no means an all-sufficing guide, nor has it been in the mind of the present writer in his attempts to discover the true kinships existing among birds, their systematic positions, and the places the various natural groups should occupy in any scheme of classification.

On the contrary, the aim has been to examine with care into the results of the anatomical and general biological investigations of birds by whomsoever they may have been undertaken and published, so long as those researches seemed to have any bearing upon the solution of the true affinities of the class. With this in view a very wide field of literature has been considered and the works of a great many authors examined. All through this osteology has held the main place, but constantly subject to subordination when factors drawn from other anatomical systems or from the general life-histories of the bird-groups possessed beyond all doubt greater weight and significance.

Bearing this in mind, and from osteological premises, let us now proceed to examine into the probable affinities of certain birds or groups of birds and how we should classify them. An inquiry of this kind would hardly seem to require any apology, inasmuch as no two systematists of all those who have published a scheme of classification for Aves since 1867, when Professor Huxley gave us his, agree upon the position in the system and the affinities of not a few of the natural avian assemblages. Take, for example, the Grebes and Loons. Huxley associated them with the Laridæ, Procellariidæ, and Alcidiæ in his group Cecomorphæ; Garrod placed them among the Ducks and Penguins in the Anseres; Forbes included the Heliornitidæ with them, and created a new group, Eretopodes; Dr. Sclater retained them as a family Colymbidæ with the Alcidiæ in the order Pygopodes; Reichenow did the same, but added the Penguins to the group and called the order Urinatores; they are a family of a superfamily, and associated with four other superfamilies,

of the Cocomorphæ in Dr. Stejneger's scheme; Dr. Fürbringer giving still other new names for orders, suborders, and genera, places them between the Flamingoes and the extinct *Hesperornithidæ*; we find them among the Galliformes in Seebohm's arrangement; and, finally, considered as two separate orders by Dr. Sharpe. Still other eminent taxonomers, as Cope, Professors Gadow and Newton, take different views of the subject. In 1890 Professor D'Arcy W. Thompson and the present writer pointed out quite independently of each other the fact that the Loons and Grebes were descendants of the *Hesperornithidæ*, an opinion previously expressed by Cope and Fürbringer. At great variance with this, Professor Newton, Lydekker, and Marsh contended that these extinct Cretaceous divers were some kind of a natatorial Ostrich. These so-called ostrich or "struthious characters" have been a stumbling-block in times past to more than one avian systematist, but I think their real significance is gradually coming to be better appreciated as time goes on. The great probability is that there was a time in the former history of the class, possibly at about the age when *Hesperornis* flourished, that all birds exhibited such characters in their skeletons. They are retained now only in a few and widely separated groups or families, as the Kiwis, the Tinamus, Ostriches, and some others.

Now, apart from a general and superficial resemblance, a typical Loon and a typical Grebe are not, to judge from their osteology, as near akin as many seem to think. Differences of a very marked character distinguish their skulls, their vertebral columns, their sterna, their pelves, and their limb-bones. Still there is a greater similarity between the skeleton of a Loon and a Grebe than there is between a Loon and any representative of the Alcæ. About this fact I have satisfied myself after having compared, character for character, as they occur in the skeletons of several species of Loons with the corresponding ones in a number of Grebes, and both with all the Auks found in our United States avifauna save *Cerorhinca*. D'Arcy Thompson has shown, beyond all question in my opinion, in his paper "On the Systematic Position of *Hesperornis*," the affinity of our modern or existing Colymbi with that ancient diver. It would seem then that the time cannot be far distant when naturalists can at least agree upon the relations that these birds bear to each other and to kindred groups. To express this relationship, Loons and Grebes should be associated in one and the same suborder, and a superfamily created for either assemblage. In a linear classification I believe their nearest relatives are the Penguins

upon the one hand and the Auks upon the other, with the Heliornithidæ in the next place as a related branch, and one more nearly so than the Laridæ or the Procellariidæ. In part, this is believed by Dr. Stejneger to be the relationship, who, however, widely dissociates the Hesperornithidæ. While this last relationship is fully appreciated by Professor Fürbringer, that eminent authority nevertheless apparently sees no special affinity between an Auk and a Loon or Grebe, and so very widely separates the Colymbo-Podicipites and the Laro-Limicolæ assemblages.

Passing next to the anserine fowls, one would think that by this time there would be more or less unanimity of opinion among systematic ornithologists as to the affinities and position of such a homogeneous group. As a family the existing Anatidæ can but contain the Mergansers, Ducks, Geese, and Swans, while the outliers, either existing or extinct, are not as a rule very puzzling forms. The anserine affinities of *Palamedea* are now pretty generally recognized; and there can be no question as to the relationships of the extinct *Cnemidornis* or *Cereopsis*. Moreover the relation borne by the Flamingoes to the Anseres has been known for a good many years past, and yet, notwithstanding all this, we find almost as much diversity of opinion among the classifiers of birds as to where this very natural group belongs, as has already been pointed out in regard to the Pygopodes. After a careful examination and comparison of the skeleton of *Palamedea*, all of our United States Anseres except one or two species, the Flamingoes, including the extinct ones and *Fulvolorus*, and a great many species and genera of Herons, Ibises, Storks, *Scopus*, and their allies near and remote, and, finally, an equal number of the Steganopodes, I was led to believe a year or two ago that the duck tribe in its widest sense, with the allied suborders containing the Palamedeidae, the Phœnicopteridae, and their fossil relatives, constituted a group, the nearest related branches to which were the Steganopodes upon the one hand and the Herodiones upon the other. An opinion practically quite similar to this is entertained by Dr. Sharpe and Dr. Stejneger, while on the other hand Dr. Gadow places the Anseriformes between the Falconiformes upon the one hand and the Crypturiformes upon the other, which of course is an utterly different view of their relationships. To discuss these latter here is obviously out of the question, as it would carry the present paper far beyond its limits. Before turning from the Anseres, however, I desire to say that I have found some interesting osteological points in the skeleton of *Dendrocygna autumnalis*, one of the tree-

ducks. Although presenting several anatomical peculiarities, this genus is one containing several species of ducks, and ducks not so very far removed from either the Teals, or the Mallard, or perhaps *Spatula*. There is very little Goose, and still less Swan, in the morphology of *Dendrocygna*, and for what reason the genus has been placed between *Phalacrocorax* and *Olor* in the 'Check-list' it is difficult for me to understand. In the first edition of his 'Manual' Mr. Ridgway places *Dendrocygna* the last genus in the duck-series where the synopses of characters of the Anseres are set forth, while in the part devoted to the diagnoses of species and genera these

Fig. 1.



Fig 2.



Fig. 1.-- Right lateral view of the skull of *Dendrocygna autumnalis*, showing complete bony ring surrounding orbit. Pterygoids lost. From a photograph by the author. $\frac{2}{3}$ nat. size.

Fig. 2.--Right lateral view of part of trunk-skeleton of same specimen. $\frac{2}{3}$ nat. size.

Tree-Ducks are placed between the Swans and the Geese, as in the 'Check-list.' They have, as I have just said, some peculiar characters about them, and of these one of the most interesting is the fact that they have complete bony rings surrounding the orbits, as is the case in several genera of parrots and some other birds. So far as I am aware it is the only genus of ducks that presents this character--indeed, the only anserine bird that has it.

Coming to the Cranes and Rails we meet with an interesting

form in *Aramus giganteus*. During the past few years I have compared the skeletons of several hundred species of birds and written out the osteology of nearly every genus in this country, and among all these have been included the entire Crane and Rail group with all the North-American birds in any way related to it. In this manner have *Grus*, *Aramus*, *Rallus*, *Porzana*, *Crer*, *Ionornis*, *Gallinula*, *Fulica*, and others been dealt with, and their skeletal characters arrayed in tabular form in great detail. Without entering upon the general taxonomy of this group, it is an interesting fact that, in so far as the skeletal characters are concerned, *Aramus* presents two for every one in favour of its affinity with *Grus* as compared with *Rallus*; yet in nearly all avian classifications we find this bird arrayed with the typical Rails. Four years ago I published in England an abstract in which was incorporated some of the facts here stated, with part of a scheme for the classification of this group. Since then I have examined a number of forms at that time not available, and although they have not materially altered my original views, some changes will necessarily have to be made in order to include those facts which have since come before me.

Of recent years nothing has come to my notice that seems likely to again check the now growing opinion that the Woodpeckers, as another assemblage of birds, see their nearest relatives in the Passeres, and they do not possess those vestiges of lacertilian morphology in the bases of their crania that were formerly supposed to exist there. The double vomers that a few years ago were attributed to them are now generally conceded to be nothing more than mesial edges of the imperfectly ossified palatines, as was pointed out by Garrod in 1872. In that year Garrod printed a brief paper in 'The Ibis,' in which he claimed that *Gecinus viridis* and its allies possessed a median vomer, though it was differently formed from the bone as it occurs among some of the Passerine birds. Nevertheless Dr. Sharpe, as late as 1891, in his extremely useful brochure 'Recent Attempts to Classify Birds,' still claims saurognathism for the *Pici*, although in the same paragraph he admits that in this entire suborder the "vomer is slender, pointed, and split" (p. 84). It is not difficult to believe that all of the alleged saurognathous characters in the skull and associated bony arches of the woodpeckers are due to changes wrought in time through the special habits of this particular group of birds, rather than that they stand in evidence as structural remnants inherited from their ancient reptilian ancestors.

VII.—*Some apparently undescribed Neotropical Homoptera.*
By W. L. DISTANT.

Fam. Cicadidæ.

Fidicina amœna, sp. n.

Head and pronotum reddish ochraceous; mesonotum and abdomen above olivaceous, the first shaded with reddish ochraceous on disk and the second at the lateral margins; mesonotum with indications of three obconical spots at anterior margin. Body beneath and legs reddish ochraceous; opercula ochraceous; sternum greyishly tomentose.

Tegmina and wings pale hyaline, venation brownish ochraceous; tegmina with the costal membrane and two thirds of basal cell brownish ochraceous; basal area of wings brownish ochraceous, irrorated with pale ochraceous.

The face is moderately tumid, with the central sulcation and the transverse stræ profound; rostrum reaching the posterior coxæ, its apex piceous; posterior tibiæ profoundly sulcate and armed with two strong spines on each side.

Long. excl. tegm., ♂, 32 millim.; exp. tegm. 88 millim.

Hab. Costa Rica, Vallée du Dignis (Pacifique) (*H. Pittier*).

A species of a uniform and unspotted hue above.

Fidicina cachla, sp. n.

Body above olivaceous, abdomen more or less suffused with reddish ochraceous. Head with the basal margin of front and space between the eyes more or less piceous; pronotum with a central longitudinal fascia, a short curved discal streak on each side, and the incisures more or less piceous; mesonotum with four obconical spots on anterior margin (the two central ones much the longest), an elongate spot in front of each anterior angle of the basal cruciform elevation and a spot on each lateral margin of same piceous. Abdomen with the basal segmental margins more or less piceous, the lateral margins near base greyishly pilose. Head beneath, sternum, and legs olivaceous; abdomen beneath ochraceous.

Tegmina and wings pale hyaline, the venation ochraceous; tegmina with the costal membrane, upper half of basal cell, and extreme lower base brownish olivaceous; wings brownish at base, irrorated with ochraceous.

The rostrum, which has its apex piceous, reaches the poste-

rior coxæ; the posterior tibiæ are longly pilose and armed with two spines on each side.

Long. excl. tegm., ♂, 25 millim.; exp. tegm. 80 millim.

Hab. Costa Rica, Rosario de Desamparados (*P. Bielley*).

Allied to *Fidicina brisa*, Walk., from British Guiana.

Fam. Fulgoridæ.

Hypæpa diversa, sp. n.

Head and pronotum testaceous; scutellum pale fuscous, with the apical margins and some discal waved fasciæ ochraceous; abdomen above ochraceous, the base dark fuscous and laterally greyish. Head beneath, sternum, and legs brownish ochraceous, legs spotted with fuscous; abdomen beneath dark fuscous.

Tegmina with the basal two thirds rosy red, beyond which the colour is greyish mottled with fuscous. Wings dark greyish, the venation and the whole basal area dark fuscous, and with three long basal radiating pale greenish streaks.

Long. excl. tegm. 12 millim.; exp. tegm. 33 millim.

Hab. Costa Rica, Las Delicias (Sta. Clara) (*P. Bielley*).

VIII.—On some South-African Homoptera.

By W. L. DISTANT.

Fam. Fulgoridæ.

Subfam. *FULGORINÆ*.

MAMATOLA, gen. nov.

Head subquadrate, a little longer than broad, lateral margins laminate and strongly reflexed at inner margins of eyes, which are large and prominent; front with the apical margin moderately angulated and with a central carina; face longer than broad, widest at base, lateral margins convexly sinuate, and with a very broad central sulcation, which is widest anteriorly. Thorax with a central carina, the anterior lateral angles slightly convex and laminate. Tegmina about twice as long as broad, the apical area strongly reticulate; costal and inner margins nearly straight, apical margin somewhat angularly convex. Wings broad and rounded. Tibiæ sulcated, posterior tibiæ armed with three or four strong spines.

Mamatola singularis, sp. n.

Head, thorax, body beneath, and legs fuscous, somewhat irrorated with pale brownish; femora and anterior and intermediate tibiæ spotted with ochraceous, posterior tibiæ pale ochraceous, speckled with brownish. Abdomen above sanguineous, with its extreme apex fuscous. Tegmina fuscous, irrorated and spotted with cretaceous. Wings sanguineous, with a very broad fuscous outer margin and with a few very small fuscous spots on basal area.

Long. excl. tegm. 13 millim.; exp. tegm. 28 millim.

Hab. Transvaal, Lydenburg District (*coll. Dist.*).

BENAMATAPA, gen. nov.

Head broad, with the eyes almost as broad as pronotum, its anterior margin convex, its disk concavely excavate; face long, broad, gradually narrowing to apex, and strongly transversely carinate. Thorax with its anterior margin concave and parallel with the excavation of head; pronotum with a central carina. Tegmina oblong, inner margin moderately sinuate, apical margin rounded. Wings broad, apical angles rounded and prominent. Legs somewhat flattened; anterior femora broad, posterior tibiæ armed with six strong spines.

Benamatapa Marshalli, sp. n.

Head, thorax, and body beneath pale fuscous; legs dark fuscous, anterior and intermediate tibiæ broadly annulated with greyish; abdomen above ochraceous, its base black. Tegmina dull ochraceous, spotted and mottled with dark fuscous, apical area palest. Wings sanguineous, with a sub-apical greyish-white fascia, apical angle and some discal spots black, posterior margin fuscous.

Long. excl. tegm. 9 millim.; exp. tegm. 18 millim.

Hab. Mashonaland, Salisbury (*Guy A. K. Marshall*: coll. *Dist.*).

Subfam. *EURYBRACHYDINÆ*.*Paropioxys jucundus*, sp. n.

Head ochraceous; abdomen testaceous, with the abdominal appendages ochraceous; thorax above pale greenish. Head with six black spots, situate two (small) in front of each eye and two (larger) near basal margin; pronotum with a transverse series of four black spots, the two central ones slightly larger; mesonotum with five black spots. Head

beneath ochraceous; body beneath and legs carmine-red; apical half of anterior femora, apex of intermediate femora, and anterior and intermediate tibiæ pale greenish spotted with black.

Tegmina pale greenish, spotted with cretaceous, with two somewhat ill-defined transverse cretaceous fasciæ, and the following shining black spots, viz.: six on costal margin, two a little above centre of inner margin, and some sixteen on apical area. Wings pale cretaceous, their apices very slightly ochraceous and containing about thirteen small black spots.

Long. excl. tegm. 12 millim.; exp. tegm. 30 millim.

Hab. Transvaal, Lydenburg District (*coll. Dist.*).

There is a specimen of this species in the British Museum localized "N'Gami Country (*Lugard*)."

IX.—*The Regeneration of Limbs in the Mantidæ, and the constant Occurrence of a Tetramerous Tarsus in Limbs regenerated after Self-mutilation among the Orthoptera pentamera**. By EDMOND BORDAGE.

NUMEROUS experiments which I have made upon the Phasmidæ, and which I have described in 'Comptes Rendus,' and before the Société de Biologie, have shown that among these insects a limb regenerated after self-mutilation constantly presents a tetramerous tarsus instead of a normal one with five joints. Messrs. Bateson and Brindley have made the same observation so far as the Blattidæ are concerned. It only therefore remains to be seen whether the same effect is produced in the third and last family of the Orthoptera pentamera, the Mantidæ.

I. I undertook the following researches in the island of Bourbon upon the two species of *Mantis* of the Mascarenes (*Mantis prasina* and *M. pustulata*) which are easy to rear in captivity.

In the case of the first pair of limbs (*predatory legs*) self-mutilation never takes place. The same does not hold good, however, in the two succeeding pairs. The leg becomes detached from the body at the groove which marks the trochantero-femoral articulation. Separation takes place with the utmost facility. The process of regeneration in the larvæ goes on with marvellous rapidity, more quickly even than

* Translated from 'Comptes Rendus,' cxxviii. (1899) pp. 1598-1599, by Wilfred Mark Webb, F.L.S.

appears in the case of the Blattidæ, but nevertheless by no means so fast as I have found it to take place in the Phasmidæ.

The tarsus of a regenerated limb is always tetramerous, and the relative size of its joints is as constant as in the normal pentamerous structure. The same thing holds good also in the case of the Phasmidæ and Blattidæ.

II. It is important to note, in the three families of the Orthoptera pentamera, the way in which the replacing limb grows. Instead of developing freely and in a rectilinear manner at the surface formed by the mutilation, the limb must continue to grow, until the next moult, under the skin, which soon covers the wound. The skin is very thin and not at all chitinized, consequently retaining a certain elasticity and transparency even in the Phasmidæ. The limb in process of regeneration barely makes a projection under the skin or is so little apparent that in most cases it needs careful examination to determine its presence.

The young limb in order to develop under these conditions is obliged to coil upon itself and assume a spiral form*. It is then not seen until the next moult sets it at liberty. When it appears it is in the form of a little blackish appendage, hardly a millimetre or two in length, a smallish limb which immediately unrolls, becoming turgescient and rectilinear. From black the limb becomes rapidly of the customary yellowish green, except in the Blattidæ and certain Phasmidæ, which are of a brown colour.

These changes take place under observation with a rapidity which is really marvellous, and comparable to that which we see in the development or, rather, extension of the wings, especially in the Lepidoptera, when the perfect insect has just left the chrysalis.

In a communication read before the Académie des Sciences (at the meeting of June 28th, 1897), I pointed out in the Phasmidæ a sensible difference between the rate of growth of a normal limb and one in process of regeneration, which was to the advantage of the latter. This difference is even more noticeable in the Blattidæ, and greater still in the Mantidæ. In the last-mentioned Orthoptera, when self-mutilation has

* Limbs in process of regeneration develop in the same way among the Orthoptera saltatoria. Such a process is also constant in regeneration that follows artificial removal of the tarsus and the distal end of the tibia, although at first sight certain differences may appear to exist. The rule ought probably to be a general one in the Arthropoda, in which regeneration of lost appendages (including antennæ) takes place. I am surprised that Messrs. Batson and Brindley have not recorded this remarkable point in their fine work on the Blattidæ.

taken place in very young larvæ, I have seen the reproduced limb attain in the interval between two moults to the size of the corresponding limb which had persisted. Such perfection, which ought also to be reached in certain cases among the Blattidæ, is never so great in the Phasmidæ. In fact, the smallest difference that I have been able to note in members of this family between corresponding limbs, one normal and one replaced, has been 4 mm. at least, and consequently noticeable enough. I must add an important point: whilst in Mantidæ and Blattidæ the regenerated limb becomes rectilinear directly after the moult which liberates it, and in the majority of instances is ready to do work immediately, this is never the case in Phasmidæ, for the newly formed leg unrolls itself bit by bit, and does not become definitely rectilinear until after the second moult which follows the automatic mutilation.

III. I have been able to determine in the Mantidæ that apart from the region of the trochantero-femoral articulation, the regenerative power is still apparent in the tarsus and in the extreme terminal part of the tibia after artificial amputation. The regenerated tarsus is four-jointed. The position of the regenerative surfaces is the same in all the three families in the Orthoptera pentamera*.

In order that there may be regeneration when artificial severance of the predatory legs is resorted to in the Mantidæ the tarsi alone must be injured. Although impeded by this mutilation, the Mantida can nevertheless seize their prey. If the least part of the tibia is wounded, the Orthopteron is unable to catch insects, and quickly dies of hunger if not from loss of blood.

Up to the present tetramerous regeneration of the tarsus has been observed in eighteen species of Orthoptera pentamera spread over the three families. The names of the insects are appended:—

A. PHASMIDÆ (Ed. Bordage's experiments).—*Monandrop-
tera inunctans*, *Raphiderus scabrosus*, *Eurycantha
horrida*, *Phyllium siccifolium* †.

* This is not surprising seeing that the same causes which bring about the mutilations (among the number of which it should be pointed out in the first place are the great strains brought to bear during moulting upon such fragile structures as the tarsus). We shall prove the same point in the case of the Orthoptera saltatoria. Among the Phasmidæ one must include the tarsal mutilations caused by the egg-shell (see 'Comptes Rendus Soc. Biologie,' Meeting of July 30, 1898, E. Bordage, "Sur les localisations des surfaces de régénération chez les Phasmes").

† Bull. Soc. entom. de France, 1898, no. 16, pp. 806 & 807.

B. MANTIDÆ (Ed. Bordage).—*Mantis prasina*, *M. pustulata*.

C. BLATTIDÆ (Brisout, Bateson, and Brindley).—*Periplaneta americana*, *P. australis*, *P. orientalis*, *Blabera atropos*, *Nyctibora latipennis*, *N. sericea*, *Epilampra cinerea*, *Homalosilpha ustulata*, *Leucophaea surinamensis*, *Monachoda grossa*, *Panesthia javanica*, *Phyllodroma germanica*.

It seems to follow from these observations that as a rule tetramerous regeneration of the tarsus in Orthoptera pentamera after self-mutilation has its seat in the trochantero-femoral groove.

X. — *On the Rutelid Beetles of the Transvaal; an Enumeration of a Collection made by Mr. W. L. Distant.*
By GILBERT J. ARROW, F.E.S.

THE insects enumerated in this paper form part of the large collection made by Mr. W. L. Distant in successive visits to the Transvaal during the years 1890–1 and 1893–6. Of the new species described here types have been kindly presented by him to the British Museum.

Anomala transvalensis, Arrow, Trans. Ent.
Soc. Lond. 1899, p. 258.

Anomala Distanti, Arrow, *ibid*.

These two species are remarkable for sexual differentiation in the structure of the claws, the female having divided claws upon each of the anterior pairs of legs and the male upon the first pair only.

Anomala ustulata, sp. n.

Elongato-ovata, pallide testacea, capite (clypeo paulo dilutiore), thoracis vittis tribus, scutelli margine (superficie tota rarius) suturaque nigris, pygidio aliquando plus minusve fusco, tarsis ferrugineis; capite parvo, rugoso, clypei margine valde reflexo; prothorace brevi, lateribus regulariter arcuatis, angulis posticis obtuse rotundatis, subtilissime punctato, linea media obsolete impresso, vitta longitudinali media et duabus obliquis lateralibus ad basim medium omnibus directis, nigris; scutello crebre punctato; elytris elongatis, post mediam ampliatis, profunde punctato-striatis, striis nonnunquam fuscescentibus; pygidio subtiliter punctato-rugoso; tibiis anticis acute bidentatis, tarsorum anteriorum et intermediorum utroque sexu unguibus externis apice

Long. 16–18 mm.

Hab. Pretoria.

This insect appears to be not uncommon. I have seen it in various collections. Although somewhat variable, it is very readily recognizable by the three dark marks, resembling a *fleur-de-lis*, which have the appearance of being burnt into the thorax.

Anomala nigrovestita, sp. n.

Elongato-ovalis, rufa, elytris nigris, pedum intermediorum et posticorum tibiis tarsisque nigris vel fuscis; capite parvo, punctato-rugoso, clypei margine semicirculari, valde reflexo; prothorace parum transverso, antice valde contracto, cum scutello subtiliter punctato; elytris fore rugose striato-punctatis; pygidio leviter striolato; pectore dense fulvo-hirto; pedibus gracilibus, tibiis anticis fortiter bidentatis, tarsorum anticorum utroque sexu unguibus externis fissis.

Long. 14-17 mm.

Hab. Johannesburg.

The species is peculiar both in form and colouring, but seems to be more closely related to *A. vetula*, Wiedem., than to any other known species of the genus; although that insect has all the claws simple, whereas the present one has a divided claw on the front tarsus. In its general form and sculpture, and especially in the size and shape of the head, it distinctly recalls that species.

Anomala marginicollis, sp. n.

Parallela, subdepressa, testacea, capite, prothoracis disco, scutello elytrisque fusco-aneis, tibiis tarsisque fusco-rufis; clypeo castaneo cum fronte rugoso-punctato, vertice haud crebre punctato, prothoracis marginibus angustis lateralibus et angulis anticis testaceis, undique subtiliter punctato; scutello crebre punctato; elytris grosse punctato-striatis, interstitiis parce subtilissimo punctatis, marginibus perspicue membranaceis; pygidio testaceo, grosse punctato; pedum anteriorum et intermediorum unguibus externis fissis, ♂ anteriorum lobo interiore late expanso.

Long. 11½ mm.

Hab. Pienaars River.

This species, of which there are three specimens, of both sexes, belongs to the small group of African *Anomalæ* represented by *A. resplendens* of Fähræus, characterized by their rectangular and somewhat depressed form.

There are several other apparently new species of this genus, which, however, are represented by one sex only and cannot properly be described at present.

Peripopillia basalis, Blanch.

This has evidently a wide range, having been previously recorded from Natal and from Zanzibar.

Popillia bipunctata, F.

Mr. Distant collected a series of this common insect showing all stages from the typical form to the variety *limbata*, described by Boheman as another species.

Nannopopillia major, sp. n.

Subparallela, nigro-anea, dense griseo-vestita; prothorace cum pedibus viridi-aneis, clytris nigris, dimidio anteriore testaceo sutura callisque humeralibus exceptis; clypeo subquadrato cum fronte granulato; prothorace undique fortiter punctato, medio obsolete sulcato, angulis anticae fere rectis; scutello grosse irregulariter punctato; elytris profunde punctato-sulcatis; pygidio punctato-rugoso, basis lateribus longe albo-hirtis.

Long. $9\frac{1}{2}$ mm.

Hab. Pretoria. A single male specimen.

The genus *Nannopopillia* has been formed by Herr Kolbe for *Popillia minuscula*, Harold, to which this species has evidently a very close relationship. It is larger, however, and the prothorax, although coarsely punctured, is not clothed with hairs except at the sides. There are long hairs upon the ventral part of the pygidium, which are probably peculiar to the male sex. As in the typical species, the larger claw of the middle as well as the front tarsus is cleft, whereas in the true *Popillia* this is always undivided in the male.

Phanomeris Beschkei, Mannerh.

This beautiful insect is common throughout a large part of South and East Africa.

Adoretus hirtellus, Lap.

This appears to be the most abundant of the numerous African species of *Adoretus*. In the Munich Catalogue it is identified with several African and Oriental species under the common name of *A. umbrosus*, Fabr., which Burmeister has pronounced to be the correct name of the present insect; but from Fabricius's description I can only regard this as very doubtful. *A. cinerarius*, Burm., is a synonym of *hirtellus*, and also *A. punctipennis*, Fähr., the insect being found over a large part of Africa; but there seems to me to be little reason to suppose that it occurs beyond that continent, or that any Oriental species ranges so far.

Adoretus xanthochrous, Har.

Two specimens were found at Barberton.

Adoretus impurus, Fähr.

A series of specimens from Pretoria shows *A. picticollis* of Fähræus, as suggested by that author, to be only a variety of *A. impurus*; and *A. flaveola*, Fähr., will probably prove to be also a pale form of the same species.

Adoretus ictericus, Burm.

A single specimen of this was brought from Barberton.

Adoretus cupreus, sp. n.

Elongato-ovatus, latus, castaneus, cupreo-nitens, supra parce subtus densius griseo-hirtus vel squamosus; capite mediocre, rugoso, clypeo arcuato ustulato; prothoraco latitudine triplo latiore, creberrime punctato, parce setuloso; scutello rugoso; elytris subtiliter rugoso-punctatis, obsolete costatis, parce setulosis, ad costulas squamis albis majoribus sparsutis, lateribus totis arcuatis. Long. 10½-12 mm.

Hab. Barberton, and in Natal.

This species has apparently some affinity with *A. picinus*, Bohem., which, however, has the prothorax coarsely punctured and the sides of the elytra straight as far as the middle. In *A. cupreus* the width of the elytra is greatest at the middle and the entire sculpture is very fine and close.

I have only seen the female of this insect, the type of which is a specimen from Natal in the British Museum.

Adoretus nasutus, Fähr.

A specimen was found at the Pienaars River.

Adoretus tessulatus, Burm.

This has also been described as *A. maculatus* by Fähræus. It is widely distributed in Southern and Eastern Africa. Mr. Distant found it at Pretoria, Pienaars River, and Zoutspan, in the Transvaal, and in the British Museum there are specimens from the Zambesi, Lake N'gami, and British East Africa.

Adoretus decoratus, sp. n.

Breviter ovatus, castaneus, capitis vertice, prothoracis disco maculisque elytralibus prope marginem externam, scutellum et epicon, indistincte fusco-seneis, corpore subtus cum pygidio rufo-

fusco, pedibus castaneis; undique sat dense fulvo-setosus vel squamosus, squamis albis aggregatis lineis tribus prothoracis, scutello elytrorum maculisque magnis rotundatis decoratus; capite parvo, prothorace antice paulo contracto, elytris medio ampliatis, omnibus grosse et laxè punctatis.

Long. 9 mm.

Hab. Pretoria.

This little insect is peculiar both for its short oval form and the pattern of white scales with which it is adorned. It appears to be fairly abundant where it occurs.

XI.—On *Hymenochirus*, a new Type of Aglossal Batrachians. By G. A. BOULENGER, F.R.S.

THE natural Suborder of Aglossal Batrachians has so long been known from two genera only, the South-American *Pipa* and the African *Xenopus*, that the discovery of a third genus is a matter of great interest, the more so as I shall be able to show that the new type stands in no very close relation to either of its nearest allies, and affords subject for comment on the classification and the geographical distribution.

In 1896 there appeared a very unsatisfactory description, accompanied by a figure, of a new Aglossal frog named *Xenopus Boettgeri*, Tornier (*Kriechthiere Deutsch-Ost-Afrikas*, p. 163), discovered by Stuhlmann at Ituri, near Wandesoma, German East Africa. From the description and figure I at once recognized that the new species could not be maintained in the genus *Xenopus*, and accordingly proposed to make it the type of a new genus, *Hymenochirus* (*Ann. & Mag. N. H.* [6] xviii. 1896, p. 420), distinguished by the half-webbed fingers, the incompletely webbed toes, the third of which exceeds the fourth in length, and, above all, by the absence of lines of sensory muciferous canals on the body. I added that no doubt a careful examination of the type specimen would reveal further differences and suggested the application of the Röntgen rays as a means of obtaining some information on the osteological characters of the unique example. I could not then have imagined that even the presence or absence of teeth had not been ascertained.

Fortunately for the progress of science the frog has now been rediscovered on the Benito River, French Congo, by Mr. G. L. Bates, from whom the British Museum has received several specimens, which I am unable to separate from the East-African type, as far as I am able to judge from Tornier's description and figure. Now, *Hymenochirus*, proves

not even to belong to the family Dactylethridæ, distinguished from the Pipidæ by the presence of teeth in the upper jaw. The mouth is edentulous, and the structure of the vertebral column and of the pectoral arch has more in common with *Pipa* than with *Xenopus*, the presence of claws to the first three toes being the only point of special affinity with the latter. *Hymenochirus* should therefore enter the Pipidæ, if dentition be deemed of sufficient taxonomic importance for family distinction. We have then a very interesting example of geographical distribution before us, and one which should remove any doubts as to the natural affinity between *Pipa* and *Xenopus*, which has been questioned by some authors, whose doubts have, however, not received the endorsement of recent investigators on the anatomy and development (cf. Beddard, P. Z. S. 1895, pp. 827 & 841, and Ridewood, Linn. Soc. xxvi. 1897, p. 53, and Anat. Anz. xiii. 1897, p. 359). The presence of only six distinct pieces in the vertebral column of *Hymenochirus*, as I have ascertained, is so far unique among Batrachians, and is only approached by the number (8) in *Pipa* and (7) in the fossil genus *Palæobatrachus*. I do not consider this as in any way adding to the evidence in favour of the allocation of the latter to the Aglossa, as advocated by some authors, since the reduction in the normal number is obtained in a quite different manner. I think the discovery by Ridewood of distinctly segmented ribs in the larvæ of both *Pipa* and *Xenopus* tends to further separate *Palæobatrachus*, of which the larvæ are well known and show no distinct ribs, from the Aglossa, and to justify their provisional retention among the Pelobatidæ.

In *Xenopus* there are 8 distinct præsacral vertebrae, as normal in Tailless Batrachians; but in *Pipa* and in *Palæobatrachus* the first vertebra is formed by the fusion of two, as proved by the passage of the first spinal nerve through the neural arch and the presence of a diapophysis, which is invariably absent from the atlas; this is also the case in *Hymenochirus*, in which the sacro-coccygeal complex is seen to be composed of the sacral vertebra and the urostyle, as in *Xenopus* and *Pipa*, with only four vertebrae intervening between it and the first, thus apparently pointing to exalation. In *Palæobatrachus*, according to Wolterstorff (Jahrb. nat. Ver. Magdeb. 1886, p. 31), 9 vertebrae may be recognized, viz., 1st and 2nd fused, 3rd, 4th, 5th, 6th free, 7th, 8th, 9th fused to form a sacrum.

On the whole the skeleton of *Hymenochirus* much more resembles that of *Pipa* than that of *Xenopus*. The following characters are common to all three genera:—

Fronto-parietals fused to a single bone.

Single ostium pharyngium.

No distinct mento-meckelians.

Sacral diapophyses extremely dilated and fused with the urostyle.

Vertebræ opisthocœlous.

Characters in common with *Pipa* :—

Fusion of the first and second vertebræ.

Coracoids much expanded towards the sternal end.

Very strong wing-like expansion of the ilia.

Characters in common with *Xenopus* :—

Sternal cartilage not embraced by, extending outwards beyond, the epicoracoid cartilages.

Long thyrohyals.

Hymenochirus stands by itself in the presence of only 5 presacral vertebræ; the second and third diapophyses are very long and subequal, but not so long and not so strongly directed forwards as in *Pipa* and *Xenopus*; the first, fourth, and fifth are shorter and also subequal. Fronto-parietal very broad, measuring half the width of the skull. Thyrohyals extremely long. Tibio-fibula with a wing-like expansion of thin bone on each side, forming a deep groove on the outer side; the two bones of the tarsus united by similar bony expansion, which projects wing-like on each side. *Pelodytes* was so far the only Batrachian in which a fusion of the astragalus with the calcaneum was known to occur, and this in a very different manner. The præcoracoids are feebly curved and form a nearly straight transverse bar, instead of an angle directed forwards.

Having thus indicated the most salient osteological features of *Hymenochirus Boettgeri*, I pass on to a description of the external characters.

Head small, very strongly flattened, a little broader than long; snout rounded, projecting slightly beyond the mouth; nostrils terminal, directed upwards and forwards; eyes small, without lids, supero-lateral; pupil round; interorbital space about half the width of the head; no tympanum. Body much depressed, twice and one third (♂) to thrice (♀) as long as the head. Fore limb rather feeble; fingers moderately elongate, sharply pointed, one-half or two-thirds webbed, first a little shorter than second, third longest; no carpal or sub-articular tubercles. Hind limb strong; tibio-tarsal articulation reaching the eye or between the shoulder and the eye; tibia two fifths to one half length of head and body; toes broadly webbed, but not to the tips, which are sharply pointed, the inner three armed with a small black claw; third

the longest; no metatarsal or subarticular tubercles. Skin everywhere rough with small granular tubercles, which are larger and conical on the sides of the body and of the limbs, and especially on the back of the thighs; no sensory canals. Vent in a short dermal prominence, not covered by lips.

Olive-brown above and beneath, uniform or with very indistinct darker spots; the larger tubercles somewhat lighter.

From snout to vent 37 millim.

In the general character of its integument, *Hymenochirus* shows great resemblance to *Pipa*, while differing in the absence of dermal appendages on the head; it also agrees with *Pipa* in having the third toe the longest, whilst the presence of claws is only paralleled by *Xenopus* among Tailless Batrachians. In its external characters, therefore, as well as in its skeleton, the new genus exhibits a singular blending of the features which distinguish the two previously known Aglossa, and serves to connect them in a most unexpected manner, whilst it adds to throw doubt on the propriety of establishing families on the presence or absence of teeth, as has been invariably the practice since the time of Duméril and Bibron. I have been the first to lower the systematic importance of that character (Cat. Batr. 1882) and subordinate it to other points of structure derived from the skeleton, in which reform I have been followed by Cope (Batr. N. Amer. 1889, p. 247); and even soon after (Ann. & Mag. N. H. [6] i. 1888, p. 188) I found cause to believe that it had been greatly overvalued as defining families, a conclusion which is further enforced by the discovery of *Hymenochirus*.

XII.—*Description of a new Genus of Gobioid Fishes from the Andes of Ecuador.* By G. A. BOULENGER, F.R.S.

OREGOBIUS.

Body elongate, cylindrical, covered with small, strongly ciliated scales; no lateral line. Mouth large, inferior, the lower jaw forming an angle at the symphysis; a single series of minute, closely-set ciliiform teeth in the upper jaw, directed downwards and inwards; two series of teeth in the lower jaw, the inner consisting of a few small canines, wide apart and erect, with the point slightly curved inwards, the outer of minute ciliiform teeth as in the upper jaw but directed outwards, perpendicular to the canines. Two dorsal fins, the anterior with six rays; second dorsal and anal elongate, similarly developed, not reaching the caudal. Ventral fins

united into a disk, which is free in its two posterior thirds.
 ' deep axillary pit.

This new genus is, perhaps, most nearly related to *Evor-*
Sac Gill, which has likewise outwardly directed mandi-
 ble-teeth, but the dentition of which is otherwise entirely
 different. The occurrence of a Gobioid fish in mountain
 streams is a fact of exceptional interest.

Oreogobius Rosenbergii.

Depth of body 6 times in total length, length of head 5 to
 5½. Length of head 1½ its width, which equals its depth;
 snout rounded; diameter of eye 1½ in length of snout, 1½ in
 interorbital width, 5 in length of head; mouth extending to
 below posterior third of eye; interorbital region and occiput
 flat; head naked; gill-cleft as wide as its distance from its
 fellow. Dorsal VI, 1 10; the space between the two fins
 equals ½ or ½ the base of the anterior; the rays much more
 elevated in the male than in the female, the longest, in both
 fins, measuring 1½ length of head in the former, hardly
 equalling the length of the head in the latter. Anal I 10, the
 longest rays measuring ¾ length of head in the male, ½ in the
 female. Pectoral rounded, with 20 rays, as long as head.
 Ventral disk a little broader than long, ½ length of head.
 Caudal rounded. A well-developed anal papilla in both sexes.
 Caudal peduncle compressed, twice as long as deep. 70 to
 76 scales in a longitudinal series, 16 or 17 between second
 dorsal and anal. Dark brown (in spirit), with more or less
 distinct yellowish cross-bars; each scale with a blackish dot;
 belly yellowish; first dorsal, anal, and pectoral blackish;
 second dorsal, and caudal greyish, with small light spots.

Total length 113 millim.

Two specimens from Paramba, N.W. Ecuador, 3500 ft.
 altitude, were obtained by the British Museum from Mr. W.
 F. Rosenberg.

XIII.—*Revision of British Mollusca.* By the Rev. Canon
 A. M. NORMAN, M.A., D.C.L., LL.D., F.R.S., &c.

[Continued from ser. 6, vol. vi. p. 341.]

THE part of the Revision which I now publish was written
 in 1890, but additions have been made in order to bring
 our knowledge up to the present time. Publication was
 delayed because I understood that Mr. Edgar A. Smith
 would continue the publication of the 'Lightning' and

'Porcupine' Mollusca, which Jeffreys, at the time of his death, had carried as far as the Cerithiopsidæ; and I felt it to be desirable to wait, as in case of such publication taking place I should be able to include species there recorded. I now print the following paper, which brings the list of British Mollusca on the descending arrangement as far as the Cerithiopsidæ, which had been reached in Jeffreys's ascending classification. I shall not publish more. Revision of arrangement and nomenclature is very desirable, but the student, from the point to which I have brought him, will be able to complete the list of known British Mollusca with little difficulty if he takes Jeffreys's 'British Conchology' as his base, and adds the species since recorded, including those procured by the 'Porcupine' and other expeditions. The following papers, which I believe to be almost, if not quite complete, containing records of species added to the British fauna, will be perhaps useful for this purpose:—

- (1) JEFFREYS, J. GWYN.—On the 'Valorous' and other Mollusca, in which notes will be found with reference to British species, Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. 1876, pp. 251 & 490, vol. xix. 1877, pp. 153, 231, 317.
- (2) NORMAN, A. M.—"On the Occurrence of *Neomenia* (*Solenopus*) in the British Seas," Ann. & Mag. Nat. Hist. ser. 5, vol. iv. p. 164.
- (3) JEFFREYS, J. GWYN.—"The Mollusca procured during the 'Lightning' and 'Porcupine' Expeditions, 1868–70," Proc. Zool. Soc. 1878, p. 393, 1879, p. 533, 1881, pp. 693 & 922, 1882, p. 656, 1883, p. 88, 1884, pp. 111 & 341, 1885, p. 27.
- (4) JEFFREYS, J. GWYN.—"New Species of *Chiton* lately found on the British Coasts," Ann. & Mag. Nat. Hist. ser. 5, vol. vi. 1880, p. 31.
- (5) MURRAY, JOHN.—"Exploration of the Faroe Channel in 1880 by H.M. hired Ship 'Knight Errant,' Proc. Roy. Soc. Edin. 1881–2. The Mollusca by J. GWYN JEFFREYS.
- (6) JEFFREYS, J. GWYN.—"Mollusca of the Cruise of the 'Triton' between the Hebrides and Faroes in 1882," Proc. Zool. Soc. 1883, p. 390; but the only stations from which Mollusca are referred to in this paper, and which are within the British area, are 1, 2, 10, 11, 13, the rest are in the Faroe Channel.
- (7) MARSHALL, J. T.—"On some new British Shells," Journ. Conchol. vol. v. 1886–88, pp. 186 & 278.

is new. *Conch.* vol. vi. 1889, p. 142.
 Sa. Gill, Rev. W. S.—“Report of a Deep-Sea Trawling
 Cruise off the S.W. of Ireland,” *Ann. & Mag. Nat.*
 Hist. ser. 6, vol. iv. 1889, p. 409. Mollusca by
 EDGAR A. SMITH.

- (10) BOURNE, G. C.—“Report Trawling Cruise in H.M.S.
 ‘Research’ off the South-west Coast of Ireland,”
Journal Marine Biol. Assoc. United Kingdom, new
 series, vol. i. 1889-90, p. 306. The Mollusca by
 A. M. NORMAN.
- (11) GARSTANG, WALTER.—“A complete List of the Opistho-
 branchiate Mollusca found at Plymouth,” *Journ.*
Marine Biol. Assoc. United Kingdom, new series,
 vol. i. 1890, p. 399.
- (12) JORDAN, H. K.—“On the Species and Varieties of the
 Genus *Fusus* which inhabit the Seas surrounding the
 British Isles,” *Journ. Conch.* vol. vi. 1890, p. 225.

In this paper species are recorded which have only been dredged in the Faroe Channel, and therefore, I consider, have no claim whatever to be regarded as members of the British fauna. All that is given respecting them is “cold area,” and the number of the station of the expedition in which they were found. Without latitude and longitude it is impossible for the ordinary reader of the paper to know their exact habitat; but a reference to the reports of the ‘Knight Errant’ and ‘Triton’ expeditions will show their habitat to be the Faroe Channel, and therefore they are not noticed in the present paper. The species referred to are the five *Fusi*, *Sabini*, Gray, *delicatus*, Jeffreys, *hirsutus*, Jeffreys, *concinus*, Jeffreys, and *lachesis*, Mörch.

- (13) MARSHALL, J. T.—“Additions to British Mollusca,”
Journ. Conch. vol. vii. 1892-4, pp. 241 & 379,
 vol. viii. 1895-7, pp. 338 & 385, vol. ix. 1898-9,
 pp. 61, 120, & 165.
- (14) CHASTER, G. W., and HEATHCOTE, W. H.—“Contri-
 bution to a List of the Marine Mollusca and Brachio-
 poda of the neighbourhood of Oban,” *Journ. Conch.*
 vol. vii. 1892-4, p. 289.
- (15) CROUCH (W.).—“*Crepidula fornicata* in Essex,” *Proc.*
Malacol. Soc. vol. i. 1893, p. 19.

Many years ago, when dredging at Salcombe, in Devon-
 shire, I found very numerous dead shells of the American
 oyster, which had been laid down there, and of *Crepidula*

fornicata, which were no doubt living on the oysters when imported, but all seemed to have perished.

- (16) CHASTER, G. W.—“*Adeorbis unisulcatus*, new Species from the Irish Coast,” Journ. Conchol. vol. viii. 1895-7, p. 873.
- (17) MARSHALL, J. T.—“The Marine Shells of Scilly,” Journ. Conchol. vol. viii. 1895-7, p. 431.
- (18) GARSTANG, W.—“On the Gastropod *Colpodaspis pusilla* of Michael Sars,” Proc. Zool. Soc., Nov. 1894, p. 664.
- (19) GARSTANG, W.—“The Aplacophorous Amphineura of the British Seas,” Proc. Malacol. Soc. vol. ii. 1896, p. 123.

In this interesting paper, under “Fam. I. Chætodermatidæ,” Mr. Garstang writes: “No British representatives.” *Chætoderma nitidulum* is, however, a member of the British fauna. It was dredged by the German expedition in 37 fathoms in the “Silver pit,” which is to the west of the Dogger Bank, and nearly east of Hull, and was described and figured by Möbius under the name *Crystallophrisson nitens*. See ‘Jahresbericht der Commiss. zur wissenschaftl. Unters. der deutschen Meere in Kiel für die Jahre 1872, 1873, 1875,’ p. 157, pl. in. figs. 6-12.

- (20) JORDAN, H. K.—“Some new Species of British Mollusca from the ‘Triton’ Expedition, with a List of other Species new to the Faroe Channel,” Proc. Malacol. Soc. vol. i. 1895, p. 264.

Some of these species I cannot receive, according to my views, as “British;” and the records of localities are most unsatisfactory—“Warm Area” being usually given without any reference to even station, still less to latitude and longitude. Mr. Jordan differs from me as regards the limits of the “British Area,” as he has a perfect right to do. But I trust that naturalists will weigh what I have written on this matter, and examine carefully with charts the conditions of the sea-bottom in the disputed area, together with Sir John Murray’s description of the Wyville Thomson Ridge and its effect upon this fauna in the ‘Knight Errant’ and ‘Triton’ Reports; and then my views will not be misunderstood as they have been by Mr. Jordan. I do not exclude the Faroe Channel only because the water is cold there, but because it geographically belongs to Faroe, and not to Britain; and the “Wyville Thomson Ridge” separates two oceans, since it slopes to the south into the Atlantic, with the “warmer area” of that ocean at 500 fathoms, and descends to the north into the Arctic Ocean, with its “cold area” of 500 fathoms.

Superorder *STREPTONEURA*, Spengel.

Order *PECTINIBRANCHIATA*.

Suborder I. *TOXOGLOSSA*.

Fam. 1. *Pleurotomidæ*.

Genus 1. *BELA*, Leach.

1. *Bela pyramidalis* (Ström).

Bela pyramidalis, G. O. Sars, Moll. Reg. Arct. Norveg. p. 222, pl. xvi. figs. 3, 4.

Pleurotoma pyramidalis, Jeffreys, Ann. & Mag. Nat. Hist. ser. 4, vol. xix. (1878) p. 328.

'Lightning' Expedition, Stat. 13, lat. $59^{\circ} 5' N.$, long. $7^{\circ} 29' W.$, north of the Hebrides, 189 fathoms (*Jeffreys*).

It is found throughout the Arctic regions of the Atlantic, and descends the American coast as far as Cape Cod. It is also found fossil in the Post-Tertiary deposits and Crag.

2. *Bela cancellata* (Migh.), var. *declivis* (Lovén).

Fusus cancellatus, Migh. Proc. Bost. Soc. Nat. Hist. i. (1840) p. 50.

Defrancia elegans, Moll. Index Moll. Grœnl. p. 80.

Tritonum declivis, Lovén, Célv. & Vet.-Akad. Forh. 1846, p. 145.

Bela declivis, G. O. Sars, Moll. Reg. Arct. Norv. p. 224, pl. xvi. fig. 10.

Taken together with the last species in the 'Lightning' Expedition, and by the 'Porcupine' Expedition, 1869, east of Shetland (Stat. 67), in 64 fathoms. Jeffreys also mentions a var. *angustior* as taken in 1869, Stat. 65, in 345 fathoms; this was to the N.W. of Shetland.

The species occurs on the Norwegian coast not uncommonly, in the Arctic seas, and on the north-east American coast, and was taken by the 'Porcupine,' 1870, on the Channel slope in 567 fathoms south of the British area.

The typical *cancellata* has not yet been found in our seas; the specimens procured belong to the var. *declivis*, Lovén.

3. *Bela cinerea* (Möller).

Defrancia cinerea, Möller, l. c. p. 80.

Bela cinerea, G. O. Sars, l. c. p. 327, pl. xxiii. fig. 4; Friele, Den Norske Nodhave-Exped. 1876-8, Mollusca, ii. (1886) p. 9, pl. vii. fig. 23, & pl. x. fig. 6.

Pleurotoma cinerea, Jeffreys, Ann. & Mag. Nat. Hist. ser. 4, vol. xix. p. 330.

Dredged by the 'Porcupine,' 1869, Stat. 78, lat. $60^{\circ} 14' N.$, long. $4^{\circ} 3' W.$, in 290 fathoms, to the east of Shetland,

It is recorded from Greenland, Spetsbergen, Iceland, and Norway.

4. *Bela Trevelyana* (Turton).

This species has been well figured both by Sars and Friele.

5. *Bela tenuicostata* (M. Sars).

Pleurotoma tenuicostata, M. Sars, Overs. Vid.-Selsk. Forh. 1868, p. 250.
Bela tenuicostata, G. O. Sars, l. c. p. 237, pl. xvii. fig. 1; Friele, l. c. p. 14, pl. viii. figs. 16, 17, pl. x. fig. 14.

'Porcupine,' 1869, Stat. 23, lat. $56^{\circ} 7' N.$, long. $14^{\circ} 19' W.$, 630 fath., to the south of Rockall.

This species is common in the Norwegian fiords. It was taken by the Norwegian N.-Atlantic Expedition at seventeen stations in depths 100-1215 fathoms; was dredged by the 'Valorous' in the Atlantic in 1450 fathoms, by the 'Porcupine,' 1870, in the Bay of Biscay, and by Verrill off the coast of New England in 1290 fathoms.

6. *Bela ovalis*, Friele.

Pleurotoma (Bela) ovalis, Friele, Nyt Mag. xxiii. (1877) p. 9, fig. 5.
Pleurotoma exigua, Jeffreys, Report 'Triton' Exped., Proc. Zool. Soc. 1883, p. 399, pl. xlv. fig. 10.
Bela pygmaea, Verrill, Trans. Connect. Acad. vol. v. pt. 2 (1882), p. 400, pl. lvii. fig. 8.
Bela ovalis, Friele, l. c. p. 14, pl. viii. figs. 21, 22, pl. x. fig. 19.

This little species, it will be seen, has been discovered by three expeditions in widely different areas soon after each other. The British locality is on the *Holténia* ground north-west of the Butt of Lewis; 'Triton' Exped., 1882, St. 13, lat. $59^{\circ} 51' N.$, long. $8^{\circ} 18' W.$, in 570 fathoms.

It was dredged by the Norwegian Exped. at eight stations in 658-1333 fathoms, and by Verrill off N.E. America in 312-1290 fathoms.

7. *Bela bicarinata* (Couthouy).

Pleurotoma bicarinata, Couthouy, Boston Journ. Nat. Hist. ii. 1839, p. 105, pl. i. fig. 11.
Pleurotoma violacea, Mighels, Proc. Boston Soc. Nat. Hist. vol. i. 1841, p. 50.
Defrancia cylindracea, *livida*, and *Deckii*, Möller, l. c. pp. 86, 87.
Bela bicarinata, G. O. Sars, l. c. p. 237, pl. xvi. figs. 11, 12.
Bela violacea, id. ib. p. 238, pl. xvii. fig. 2.
Bela bicarinata, Friele, l. c. p. 15, pl. viii. figs. 18, 19, pl. x. figs. 15, 16.
Pleurotoma bicarinata, Jeffreys, Ann. & Mag. Nat. Hist. ser. 4, vol. xix. (1877) p. 325.

'Porcupine,' 1869, to the south of Rockall, St. 23 a, lat. 9*

56° 13' N., long. 14° 18' W., 420 fathoms; west of Shetland, St. 73, lat. 60° 39' N., long. 3° 9' W., 203 fathoms.

It is found in Norway, generally within the Arctic Circle, in the Gulf of St. Lawrence, and off the N.E. American coast.

8. *Bela exarata* (Möller).

Defrancia exarata, Möll. l. c. p. 85.

Tritonium nitululum, Lovén, Öfvers. Vet.-Akad. Forh. (Index Moll. Scand.) 1846, p. 145.

Bela exarata, G. O. Sars, l. c. p. 232, pl. xvi. fig. 18.

Bela nitula, id. ib. p. 233, pl. xxiii. fig. 9.

Bela concinnula, Verrill, Trans. Connect. Acad. vol. v. pt. 2 (1882), p. 468, pl. xliii. fig. 15, and pl. lvii. fig. 11.

Pleurotoma exarata, Jeffreys, Ann. & Mag. Nat. Hist. ser. 4, vol. xix. (1877) p. 332.

'Porcupine' Expedition, 1869, "164-1230 fathoms off the west of Ireland" (*Jeffreys*), that is, St. 25, lat. 56° 41' N., long. 13° 39' W., near Rockall; and St. 17, lat. 54° 28' N., long. 11° 44' W., to the west of Donegal Bay.

Its distribution is Norway, Arctic Ocean generally, and North-east America. It is fossil in the Crag (*A. Bell*).

9. *Bela turricula* (Montagu).

Jeffreys, in his account of the 'Valorous' Mollusca, writes:—"The sculpture is extremely variable. Having before me a large number of specimens from various parts of the North Atlantic, and after a careful examination and comparison of types of several so-called species, both recent and fossil, I am convinced that the following must be considered synonyms of the present species:—*Defrancia nobilis*, *scalaris*, and *Woodiana* of Möller, *Tritonium roseum* of M. Sars, *Bela americana* of Packard, and *Pleurotoma Dowsoni* and *robusta* of S. V. Wood. *P. harpularia* of Couthouy may be distinct, but it is questionable."

It is therefore doubtful whether any or which of the forms here referred to as synonyms were procured in the 'Porcupine' Expedition.

I am myself inclined to regard *B. scalaris* and *B. nobilis* as forms of *turricula*; and, judging from Searles Wood's figures, *P. Dowsoni* and *robusta* are also referable to it. I would, moreover, include *Bela exarata*, but hesitate as to *B. rosea*, and I doubt if the shell so called by Sars has been found in our seas, though *Jeffreys* records it from Oban.

B. turricula is very variable in sculpture in British seas, but the lattice-work is always less raised than in the Norwegian *B. scalaris* and *nobilis*, though of similar

character. I have remarkably large specimens from the Dogger Bank, one inch in length. Off the coast of Marocco, 'Travailleur' (Locard).

Var. *ecostata*, Norman.

Longitudinal riblets of upper whorls more numerous than in the type, but very small and scarcely raised, while on the body-whorl they are either wholly absent, or in other cases only faintly visible.
Dublin Bay (from the late Mr. W. W. Walpole).

10. *Bela rufa* (Montagu), = *Pleurotoma rufa*, Jeffreys.

Var. 1. *luctea*, Jeffr.

Var. 2. *semicostata*, Jeffr.

Var. 3. *Ulideana*, Thompson.

Var. 4. *Cranchii*, Brown.

Var. 5. *angusta*, Jeffr.

Jeffreys states that Sars found this species in Finmark. This is a mistake, as it does not occur in Norway or Finmark; indeed its range is unusually limited. It is not recorded from the Mediterranean.

Genus 2. TYPHLOMANGILIA, G. O. Sars.

1. *Typhlomangilia nivalis* (Lovén).

Pleurotoma nivalis, Jeffreys, Brit. Conch. iv. p. 388, v. p. 220, pl. xci. fig. 4.

Typhlomangilia nivalis, G. O. Sars, l. c. p. 241, pl. xvii. fig. 6.

Dredged by Dr. Jeffreys and myself off Unst, Shetland, in 120 fathoms, and by the 'Porcupine,' 1869, "N. of Hebrides, in 170 f." *

I have dredged it frequently in the fiords of West Norway, and Sars has procured it as far north as the Lofoten Islands. It was dredged by the 'Travailleur' in 1882 off the east of Portugal (Locard).

Genus 3. SPIROTROPIS, G. O. Sars.

1. *Spirotropis carinata* (Philippi).

"*Fusus modiolus*, Cristofori & Jan, Cat. 1832, p. 10" (sic Jeffreys).

Pleurotoma carinatum, Philippi, Enum. Mollusc. Siciliæ, vol. ii. p. 176, pl. xxvi. fig. 19.

* Jeffreys does not give the station, and the exact depth is not recorded for any station. The nearest is Stat. G, 167 fathoms; and if that station is intended, it is not within the British area.

Pleurotoma carinata, Jeffreys, Brit. Conchol. vol. v. p. 221, pl. cii. fig. 7.

Spirotropis carinata, G. O. Sars, l. c. p. 242, pl. xvii. fig. 5 a, b (figura bona).

Dredged by Dr. Jeffreys and myself N.N.W. of Unst, Shetland, in 120 fathoms, living. 'Porcupine,' 1869, "N. of Hebrides, 189 fath." *

I have dredged it frequently in the Norwegian fiords, and it occurs in the Mediterranean. By the 'Travailleur' it was obtained off the coasts of Spain, Portugal, and Marocco, and as far south as the Canary Islands (*Locard*).

Genus 4. DRILLIA, Gray.

1. *Drillia semicolon* (Searles Wood).

Pleurotoma semicolon (J. Sow. P), Searles Wood, Crag Moll., Univalves, p. 54, pl. v. fig. 3.

Pleurotoma galerita, Jeffreys, Brit. Conch. v. p. 221, pl. cii. fig. 6.

Pleurotoma semicolon, Monterosato, Nuova Revista delle Conch. Medit. 1875, p. 42.

Jeffreys (Brit. Conch. v. p. 221) writes:—"A fresh but dead specimen of *P. galerita*, Ph. (*P. galeritum*, Moll. Sic. ii. p. 172, t. xxvi. fig. 15), was dredged by Carpenter and Thomson in 189 fathoms, about 50 miles N. of the Butt of Lewis. It is a very rare Calabrian fossil." Philippi's figure, however, does not at all resemble that of Jeffreys, and Monterosato writes:—"Il *P. galeritum*, Ph. = *subasperum*, Brugnone, fossile di Calabria e di Sicilia, è differente." Mediterranean, 50-100 fath. (*Jeffreys*, dredgings of Capt. Spratt and Nares).

Genus 5. HÆDROPLEURA, Monterosato MSS.

(Bucquoy, Dautzenberg, and G. Dollfus, Moll. Marins du Roussillon, p. 110).

1. *Hædropleura septangularis* (Montagu), = *Pleurotoma septangularis*, Jeffr.

This species, which is operculated, cannot be retained in the same genus with the inoperculated *Mangilia*.

Genus 6. MANGILIA, Risso.

1. *Mangilia striolata* (Scacchi).

2. *Mangilia attenuata* (Montagu).

* This exact depth is not given for any station; probably Stat. 85, 190 fathoms. I have a good living specimen, dredged by the 'Porcupine' and given me by Sir Wyville Thomson.

3. *Mangilia costata* (Donovan).

Var. *coarctata*, Forbes & Hanley.

4. *Mangilia rugulosa* (Philippi).

5. *Mangilia brachystoma* (Philippi).

6. *Mangilia nebula* (Montagu).

Var. 1. *elongata*, Jeffr.

Much larger, $\frac{3}{4}$ inch long, pale in colour; ribs little raised; spiral striæ faint or absent. Bantry and Shetland (*A. M. N.*).

Var. 2. *lævigata*, Philippi, = *Pleurotoma lævigata*, var. *minor* (Jeffreys).

"Anfractibus planiusculis, contiguïs, lævibus, sub lente tenuissime striatis, superne *obsolete* plicatis; apertura oblonga, tertiam longitudinis partem æquante; cauda brevissima" (*Philippi*). Ribs of last whorl evanescent or absent.

Var. 3. *vittata*, Norman, = *Pleurotoma lævigata*, Jeffreys (partim).

"The space below the suture is girded by a thickened rim, and is always ribless" (*Jeffreys*). Jeffreys's var. *minor* is no doubt the true *lævigata*; but this remarkably fine shell, which he and I took together living between tide-marks at Belgrave Bay, Guernsey, and from which his description of *lævigata* was taken, differs much more widely from the typical *nebula* than do the true *lævigata*. It is like *lævigata* in general character, but attains a large size, $\frac{1}{6}$ inch, and has a marked rounded smooth fillet passing round the summit of each whorl and projected over the preceding one. I have seen nothing like this in Mediterranean *lævigata*, examined from many localities, nor is this fillet described by any other writer.

Var. 4. *luctea*, Jeffreys.

Subgenus 1. *PLEUROTOMELLA*, Verrill.

7. *Mangilia Packardii*, Verrill.

Pleurotomella Packardii, Verrill, Amer. Journ. Sci. v. p. 15 (Dec. 1872); Trans. Conn. Acad. vol. v. p. 459, pl. xliii. fig. 9, pl. lvii. fig. 5, vol. vi. p. 266.

Defrancia formosa, Jeffreys, Proc. Zool. Soc. 1883, p. 397, pl. xliv. figs. 9, 9 a, 9 b; Watson, Rep. 'Challenger,' Gast. (1885) p. 349.

Pleurotomella Saffardi, Verrill & Smith, Trans. Conn. Acad. vi. (1884), p. 151, pl. xxxi figs. 4, 4 a.

Pleurotomella Puckardii, var. *formosa*, Dall, Bull. Mus. Comp. Zool. vol. xviii. (1889) p. 119.

'Porcupine,' 1869, St. 65, lat. $61^{\circ} 10' N.$, long. $2^{\circ} 21' W.$, 345 fathoms. 'Triton,' 1882, St. 13, lat. $59^{\circ} 51' N.$, long. $5^{\circ} 18' W.$, 570 fathoms, a single specimen (*Jeffreys*). 'Triton,' 1882, St. 11, lat. $59^{\circ} 30' N.$, long. $7^{\circ} 13' W.$, 555 fathoms (*Norman*).

It has been found off the east coast of America in 85 to 1608 fathoms; by the 'Porcupine,' 1870, off the Lusitanian coast, in 414-1095 fathoms; by the 'Challenger' off the Azores, 1000 fathoms, off the Canaries in 1125 fathoms, and off Culebra Island, West Indies, in 390 fathoms. A fragment of this species has also been procured by Prof. G. O. Sars in 400 fathoms, Storeggen, off the Norwegian coast.

Subgenus 2. *THESBIA*, *Jeffreys*.

8. *Mangilia nana* (*Lovén*).

Columbella (*Thesbia*) *nana*, *Jeffreys*, Brit. Conchol. vol. iv. p. 359, pl. lxxxvii. fig. 4.

Jeffreys placed this species in the genus *Columbella*, which has an operculum, and differs widely from this little species.

Subgenus 3. *TERETIA* (*Teres*, emend.), *Bucq.*, *Dautz.*, & *Dollf.* 1882.

9. *Mangilia anceps* (*Eichwald*).

Pleurotoma anceps, *Eichwald*, Naturhist. von Lith. und Volh. (1830), p. 225.

Pleurotoma teres, *Forbes* (non *Reeve*), Rep. Aegean Invert. 1844, pp. 139 & 190, and Ann. & Mag. Nat. Hist. vol. xiv. (1844) p. 412, pl. x. fig. 3.

Defrancia teres, *Jeffreys*, Brit. Conch. vol. iv. p. 362, pl. xxxviii. fig. 5.

Raphitoma anceps, (*G. O. Sars*, l. c. p. 219, pl. xvii. fig. 9).

Pleurotoma (*Teres*) *anceps*, *Bucq.*, *Dautz.*, & *Dollf.* Moll. Marines du Roussillon, 1883, p. 27 and woodcut.

Subgenus 4. *BELLARDIELLA*, *P. Fischer*, 1883
(Man. de Conchyl. p. 693).

10. *Mangiliagracilis* (*Montagu*), = *Defrancia gracilis*, *Jeffreys*.

I have followed *Fischer's* arrangement in including the foregoing subgenera under *Mangilia*; but the last two can scarcely ultimately remain in that position, the labial sinus of their lip clearly distinguishing them from *Mangilia* proper. I have kept the next genus distinct, as it appears to embrace a natural group.

Genus 7. CLATHURELLA, Carpenter, 1857
(= *Defrancia*, Millet, 1826, but not of Bronn, 1825).

1. *Clathurella linearis* (Montagu), = *Defrancia linearis*, Jeffreys.

Var. *intermedia*, F. & H., = *æqualis*, Jeffr.

2. *Clathurella reticulata* (Renier), = *Defrancia reticulata*, Jeffreys.

Var. *asperrima*, F. & H., = var. *formosa*, Jeffr.

3. *Clathurella purpurea* (Montagu), = *Defrancia purpurea*, Jeffreys.

Var. 1. *Philberti*, Michaud.

Var. 2. *La Viæ*, Phil., = var. *oblonga*, Jeffr.

4. *Clathurella Leufroyi* (Michaud).

Var. *carnosula*, Jeffr.

Fam. 2. Cancellariidæ.

Genus 1. ADMETE, Möller.

1. *Admete viridula* (Fabricius).

Trilonium viridulum, Fabricius, Faun. Groenl. 1780, p. 402.

Admete viridula, G. O. Sars, l. c. p. 216, pl. xiii. figs. 1 a, b, 2; Friele, l. c. p. 24, pl. viii. figs. 27-30.

Cancellaria viridula, Jeffreys, Ann. & Mag. Nat. Hist. ser. 4, vol. xix. p. 322.

The following locality is within the British area:—
'Porcupine,' 1869, Stat. 65, lat. 61° 10' N., long. 2° 21' W., 345 fath. to the N.W. of Shetland.

Admete viridula has a very extensive northern range. It is found in all parts of Arctic Europe, and on the coasts of Norway and the United States; in Behring Strait and N. Japan. It was taken, 'Porcupine,' Stat. 1, 1870, in 567 fath. on the slope of the English Channel.

It is found fossil in the Red and Coralline Crag.

Suborder II. RHACHIGLOSSA.

Fam. 1. Fasciolariidæ.

Genus 1. TROSCHELIA, Mörch, 1876
(= *Boreofusus*, G. O. Sars, 1878).

1. *Troschelia berniciensis* (King).

'Triton,' St. 13, lat. 59° 51' N., long. 8° 18' W., 570 fath.

'Lightning,' St. 13, lat. $59^{\circ} 5' N.$, long. $7^{\circ} 29' W.$, 189 fath., off Butt of Lewis.

Var. *elegans*, Jeffreys.

Off Shetland, 78-100 fath. (*Jeffreys & Norman*).
'Porcupine,' 1869, St. 84, lat. $59^{\circ} 34' N.$, long. $6^{\circ} 34' W.$, 155 fath.

Var. *inflata*, Jeffreys. Spire shorter, whorls more swollen, shell thin and delicate.

'Porcupine,' 1869, St. 74, lat. $60^{\circ} 39' N.$, long. $3^{\circ} 9' W.$, 203 fath.; St. 78, lat. $60^{\circ} 14' N.$, long. $4^{\circ} 30' W.$, 290 fath.

The type was taken in the Bay of Biscay by the 'Porcupine' and 'Travailleur' expeditions, and together with the two varieties by the 'Vöringen' expedition. Its range has been extended as far south as coast of Morocco and the Canary Isles by the 'Talisman' (*Locard*).

Fam. 2. Turbinellidæ.

Genus 1. METZGERIA, Norman, 1878 (= *Meyeria*, Dunker & Metzger, 1878 (nec *Meyeria*, M'Coy, Crust. 1849)).

[*Metzgeria alba* (Jeffreys).]

Tritonium pusillum, M. Sars, Overs. Vidensk.-Selsk. Forhand. 1858, p. 39 (name only).

Latirus albus, Jeffreys, in Wyville Thomson's *Depths of the Sea*, 1873, p. 464 (woodcut).

Lathyrus and *Meyeria albellus*, Dunker & Metzger, Nach. d. deutsch. malak.-zool. Gesellschaft, 1874, p. 8, and Zool. Ergebnisse der Nord-seefahrt, 1874, pp. 257 & 264 and woodcut.

Metzgeria alba, Norman, Mollusca of the Bergen Fiords, Journ. of Conchology, vol. ii. 1879, p. 56.

Meyeria pusilla, G. O. Sars, l. c. 1878, p. 245, pl. xiii. fig. 8.

In the 'Depths of the Sea' this species is spoken of as "an interesting addition to the already famous Shetland fauna," but under the woodcut is written "Faroe Channel." Unfortunately no station is mentioned, and therefore at present, until Dr. Jeffreys's MS. is published, some doubt must attach to its being found in our area. Jeffreys gave me a fine living example from the dredging of 1869, but unfortunately without station also.

On the West Norwegian coast I have dredged it in Bergen Fiord; off Sartoro, in 15-40 fath.; Solems Fiord, Florø, in 100-250 fath.; and near the mouth of the Hardanger Fiords

in many places, in 50-100 fath. ; and in Stoksund, 125 fath. Dredged as far south as the Azores by the 'Talisman' (Locard).]

Fam. 3. Buccinidæ.

Genus 1. NEPTUNEA, Bolten, 1789.

1. *Neptunea antiqua* (Linn.).

2. *Neptunea despecta*, Linn.

Murex despectus, Linn. Syst. Nat. 1222.

Fusus tornatus, Gould, Invert. Mass., edit. Binney (1870), p. 374.

Neptunea despecta, G. O. Sars, l. c. p. 267, pl. xiv. figs. 4 a-c.

'Porcupine,' 1869, St. 1, off Valentia, Ireland, 110 fath., and between Galway and the 'Porcupine' Bank. Also off South of Ireland (in *Mus. Nor.*).

Its distribution is Christiania Fiord, Western Norway and Finnmark, Iceland, Arctic Europe generally, Greenland and N.E. America, Siberia.

It is a most variable species, and *Neptunea antiqua* seems to be its southern form ; and the species becomes keeled more or less, and then nodulous as the *Neptunea* is found under increasing boreal and arctic conditions.

Genus 2. UKKO, Friele (= *Jumala*, Friele).

For this change in the generic name see Norman, "A Month on the Trondhjem Fiord," Ann. & Mag. Nat. Hist. ser. 6, vol. xii., Nov. 1893, p. 352.

1. *Ukko Turtoni* (Bean).

In the paper just referred to I have figured two Norwegian forms of this shell.

Genus 3. VOLUTORSIS, Mörch.

1. *Volutopsis norvegica* (Chemn.).

Genus 4. SIPHO, Klein.

Subgenus 1. SIPHO (typical).

* Apex irregular.

1. *Sipho islandicus* (Chemn.).

Long ago Mr. Walpole procured a specimen from off the Wexford coast which is now in the collection of Dr. Mason, of Burton, who purchased Walpole's Mollusca. In 1861 I

dredged two dead examples 40 to 50 miles off the south-eastern coast of Shetland in 78 fathoms. Jeffreys had the more important Mollusca in these expeditions, while I had the animals of other classes, and these two specimens are now in the United States National Museum. It has not been again met with in our seas until the last few years, when specimens have been obtained from fishermen's lines from the west of Dummory, Co. Waterford. Two of these I procured through Mr. C. Jeffreys, of Tenby. They are living and very fine shells, $4\frac{1}{2}$ inches long. One when sent off to me was still alive, and when it arrived, though dead, the animal was quite sweet and fresh. 'Porcupine,' 1869, between Galway and the 'Porcupine' Bank. *Sipho islandicus* was dredged by the 'Vöringen' as far north as midway between Beeren Island and Spetsbergen in 123 fath. Its most southern known locality is coast of Morocco, 'Talisman' (Locard).

2. *Sipho gracilis* (Da Costa).

This species is subject to very considerable variation. Mr. H. Jordan has described ('Journal of Conchology,' vol. vi. 1890, p. 232) three British forms under the names var. *Belliniana*, var. *Coulsoni*, and var. *convoluta*, the first from the coasts of Wexford and Waterford, the second from Shetland (where it is the common form on the "Haaf"), the last from Wick, N.B.; but these varieties can scarcely be recognized by descriptions. Var. *convoluta* has been sent to me by Mr. Jordan from another locality, the Scilly Islands, and I have fine examples of it from the Dogger Bank. The *Sipho glaber* of Verkrusen and Sars (*l. c.* p. 271, pl. xv. fig. 7) is also nothing more than a short variety of *S. gracilis* in which also the spiral sculpture is almost obsolete. The range of the species southwards extends to Morocco, where it was dredged by the 'Talisman' (Locard).

3. *Sipho turgidulus* (Jeffreys, MS.), Friele.

Fusus turgidulus (Jeffr. MS.), Friele, *Nyt Mag. for Naturvidenskab.* 1877, p. 8, Kobelt, *Jahrb. mal. Gesells.* vol. iv. (1877) p. 278, pl. iv. *Neptunea* (*Sipho*) *turgidula*, Friele, *Norske Nordhavs-Exped., Buccinidæ* (1882), p. 11, pl. i. figs. 13-18, pl. iv. figs. 11-28; Kobelt, *Mart. u. Chemn. Conch.-Cab.* ii. p. 110, pl. i. figs. 13-18, pl. iv. figs. 14-28; Kobelt, *Icon. schlentr. europ. Meeresconch.* vol. i. Heft 3 (1885), p. 74, pl. xi. figs. 4, 5.

In the 'Porcupine' expedition, 1869, it was met with in 155 and 345 fathoms. This gives us St. 84, lat. $59^{\circ} 34' N.$,

long. $6^{\circ} 34' W.$, and St. 65, $61^{\circ} 10' N.$, long. $2^{\circ} 21' W.$; the first of these is North of the Butt of Lewis, the second N.W. of Shetland.

By the 'Vöringen' it was dredged in 223-649 fath. at six stations, the most northern being lat. $72^{\circ} 53' N.$, long. $19^{\circ} 52' E.$ By the 'Travailleur' it was dredged off the coast of Spain (Locard).

Subgenus 2. SIPHONORBIS, Mörch.

** Apex depressed; embryonic whorls gradually diminishing; antigyrus.

4. *Sipho propinquus* (Alder).

'Porcupine,' 1869, N. of Hebrides, 189-530 fath.

5. *Sipho Jeffreysianus* (Fischer).

Fusus buccinatus, Jeffreys, B. C. iv. (1868), p. 340 (nec *F. buccinatus*, Lamarck).

Fusus Jeffreysianus, Fischer, Journ. de Conchyl. xvi. p. 37; Actes de la Soc. Linn. de Bordeaux, xxviii. (1889) p. 141.

Fusus Jeffreysianus, Jeffreys, B. C. v. p. 219, pl. lxxxvi. fig. 4.

Fischer records it from all the S.W. coasts of France, and Locard as taken off the north of Spain by the 'Travailleur.'

6. *Sipho attenuatus* (Jeffreys).

Fusus attenuatus, Jeffreys, Proc. Roy. Soc. xviii. no. 121 (1870), p. 434 (name only); Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. (1876) p. 326.

"Shell spindle-shaped, solid, opaque, rather glossy; the periphery is bluntly angled in a half-grown specimen; *sculpture* consisting of numerous spiral impressed lines and of minute close-set and slight lines of growth; *colour* ivory-white; *epidermis* thin and smooth, pale yellowish white; spire long and slender, tapering to a very blunt and regularly spiral point, which is not mamillar or twisted; *whorls* 8-9, compressed, especially below the suture; the last occupies about two thirds of the shell, when viewed with the mouth upwards; the topmost whorls are nearly equal in breadth; *suture* distinct, but not channelled nor deep; it is defined by a thickened edge; *mouth* oblong, acute-angled above, its length, including that of the canal, is about two fifths of the shell; *canal* open, rather long and straight; *outer lip* thin, smooth inside; *inner lip* filmy; *pillar* flexuous; *operculum* ear-shaped, yellowish brown, curved on the outer side and incurved towards the base on the inner side; it is marked with a few slightly impressed lines, which radiate towards the terminal nucleus. L. 2.25. B. 0.85."

'Porcupine,' 1869, St. 28, lat. $56^{\circ} 44' N.$, long. $12^{\circ} 52' W.$, 1215 fath., which is S.S.E. from Rockall. Jeffreys also gives off West of Ireland, "1180," but there was no dredging at that depth. St. 43, lat. $50^{\circ} 1' N.$, long. $12^{\circ} 26' W.$, 1207 fath.

It was dredged by the 'Valorous' in the Atlantic on the top of a mountain which was discovered (St. 13, lat. $56^{\circ} 1' N.$, long. $34^{\circ} 42' W.$) rising some 4500 feet out of the surrounding abyss, but still covered by 690 fathoms of water.

I have thought it well to give Jeffreys's description because at present there is much uncertainty as regards this shell. Is it the same as G. O. Sars's *Sipho tortuosus*, var. *attenuatus*, who has stated that Jeffreys so regarded it? But later (1883) in 'Triton' Report, Jeffreys writes:—"My *Fusus attenuatus* is not a variety of that species" [*i. e.* *tortuosus*], but does not state whether he considered it the same as Sars's Finmarkian var. *attenuatus*.

I retain it as doubtfully distinct in consequence of a passage in Friele's Monograph of the 'Vöringen' Buccinidæ, and I put much trust in his judgment.

But first let me state that Friele considers the three forms described and figured by Sars, which include his var. *attenuatus*, to be one species, which is (*Fusus tortuosus*, Reeve, probably) *Tritonium turritum*, M. Sars, = *Sipho tortuosus*, Kobelt and G. O. Sars, = *Chrysodomus turritus*, Dall*. Sars and Friele have had large series of these shells through their hands, and as they agree their judgment may be regarded as pretty conclusive. Judging from the Finmarkian examples of the three forms which I possess, I also am of the same opinion; and to the synonyms I should be inclined to add as a variety in which the shell is rather wider than usual *Fusus delicatus*, Jeffreys ('Triton' Exped., Proc. Zool. Soc. 1883, p. 396, pl. xlv. fig. 6). Moreover, it may be noted that the *Neptunea attenuata* of Kobelt (Icon. europ. Meeresconchylien, p. 78, pl. xiv. fig. 12) is a copy of Sars's figure of his var. *attenuatus*.

Respecting Jeffreys's shell, Friele writes:—"Sars states that Dr. Jeffreys has himself identified the variety *attenuata* (l. c. pl. xv. fig. 5) as *Fusus attenuatus*, Jeffreys. I had opportunity of examining this form in Dr. Jeffreys's collection; but *Fusus attenuatus*, it appeared to me, was a species perfectly distinct from *Neptunea turrita*. The canal, I observed, was comparatively more open and straight, and the whorls flatter."

* In 'Valorous' Report Jeffreys calls *turritus* a variety of *propinquus*; in 'Knight Errant' Report, later, he says "not *F. propinquus*, Alder, var."

It is worthy of notice that even the var. *attenuata* of Sars is subject to considerable difference of contour. My example from Tromsø, received from Herr Schneider, though smaller than that figured by Sars, being just $1\frac{1}{2}$ inch, has an additional whorl, and is narrower in proportion to its length, thus approaching more in proportion to *S. lachesis*, to which, however, its comparatively flattened whorls and twisted canal show no approach. Locard records this species as taken off the coast of Marocco by the 'Travailleur.'

7. *Sipho ebur*, Mörch.

Fusus (*Siphonorbis*) *ebur*, Mörch, Journ. d. Conch. (1869), p. 308*.

Trophon Sarsii, Jeffr., S. Wood, Suppl. Crag Moll. (1872), p. 25, pl. i. fig. 9.

Fusus Moebii, Dunker and Metzger, Jahresb. der Comm. zur Unters. der deutschen Meere, 1874, p. 360, pl. vi. fig. 1.

Neptunea (*Siphonorbis*) *ebur*, Friele, Norske Nordhavs-Exp., Buccinidae (1882), p. 18, pl. ii. figs. 20-23, pl. v. figs. 1-3.

Neptunea ebur, Kobelt, Icon. europ. Meeresconch. Heft 3 (1885), p. 13, pl. xiii. figs. 5, 6 (copies from Friele).

Neptunea Sarsii, Kobelt, l. c. p. 79, pl. xiii. figs. 7, 8 (fig. 8, copy from G. O. Sars).

'Knight Errant,' 1880, Stat. 5, lat. $59^{\circ} 26'$ N., long. $7^{\circ} 19'$ W., 515 fathoms, near the *Holtunia* ground, N.W. from the Butt of Lewis.

I have dredged young specimens in the neighbourhood of Lervig in the Hardanger Fiord in 100-210 fathoms, which is, I believe, its present known southern limit in Norway; Kois Fiord, near Bergen, 300 fathoms (Friele); and ranging straight up the coasts of Norway and Finmark "to the tract of ocean between Norway and Novaja Zemlja, lat. $72^{\circ} 31'$ N., long. $21^{\circ} 51'$ E. (Friele)." Coast of Greenland (Mösch).

Fossil in the Crag (Searles Wood).

8. *Sipho fusiformis* (Broderip).

Buccinum fusiforme, Broderip, Zool. Journ. v. p. 45, pl. iii. fig. 3.

Fusus fenestratus, Turton, Mag. Nat. Hist. vii. p. 391; Jeffreys, B. C. iii. p. 343.

One of the original British specimens procured by Humphreys from fish-stomachs at Cork, which was in Walpole's collection and passed thence to that of Dr. Mason, was kindly given me by the latter. 'Porcupine,' 1869, off the mouth of the Shannon, Ireland, 90 fathoms (St. 6); 'Flying-Fox,' 1889, 110 fathoms, off the south coast of Ireland, a very fine specimen 52 mm. in length (E. A. Smith).

* This was disputed by Jeffreys, but Friele has compared types, for observations on which see his paper.

F. fenestratus generally occurs in 100–200 fathoms, and is found throughout Norway, where I have dredged it fine and living in two places near the mouth of the Hardanger Fiord in 80–120 fathoms. Friele records it in the ocean as far north as lat. 72° 27' N., long. 20° 51' E. Jeffreys took it in the 'Valorous' in Davis Strait, 410 fathoms (the greatest depth recorded for the species), and mentions its occurrence in the Bay of Biscay, where E. A. Smith, on authority of Jeffreys's MSS., states that it was dredged by the 'Travailleur' in 277 to 731 fathoms, also off coast of Marocco (*Locard*).

Genus 5. *LIOMESUS*, Stimpson, 1865
(= *Buccinopsis*, Jeffreys, 1863; non Conrad, 1857,
nec Deshayes, 1865).

1. *Liomesus Dalei* (J. Sow.).

To the west of St. Kilda, 100 fathoms (*Hoyle*).

2. *Liomesus* (?) *striatus* (Jeffreys).

Buccinopsis striata, Jeffreys, in Wyville Thomson's 'Depths of the Sea,' p. 463, and woodcut p. 364.

This remarkable-looking shell is stated to be "another interesting addition to the already famous Shetland fauna," but no station or depth is given. Its retention in this genus is very problematical.

Genus 6. *BUCCINUM*, Linné.

1. *Buccinum undatum*, Linn.

I have found the true *Buccinum undatum* as far north-east as Vadsö, on the Varanger Fiord. There it occurs between tide-marks, and near at hand, in similar position, *B. grønlandicum*; while at another part, all within a range of less than half a mile, there occurs in abundance a *Buccinum*, which is, I believe, unknown elsewhere, and is so intermediate between these two species, that it is difficult to say to which it should be referred. In size it resembles more nearly the latter; but many of the specimens have sculpturing closely analogous to that of the former. It is possibly a hybrid. It has been named *B. parvulum*, Verkrusen. Another northern form of this species is *B. Schneideri*, Verkrusen, a very pretty milk-white form from deep water off Vardö, where it lives in company with *B. perditæ*, Mörch (= *B. finmarchianum*, Sars).

2. *Buccinum Humphreysianum*, Bennett.

'Porcupine,' 1869, St. 1, off Valentia, 110 fathoms.

'Porcupine,' 1870, and 'Travailleur,' Bay of Biscay (*Jeffreys*); Norwegian coast, where I have dredged it at the entrance of Fane Fiord near Bergen, and at Florø in 47-70 fathoms.

Genus 7. *DONOVANIA*, Bucq., Dautz., & Dollf.

(= *Lachesis*, Risso, 1826 (preoccupied)).

Donovania minima, Bucq., Dautz., & Dollf. *Mollusques Marins du Roussillon*, 1883, p. 112, pl. xv. figs. 26-30.

Donovania minima, Martin T. Woodward, Some Account of the Synonymy and Affinities of *Donovania minima*, Proc. Malacol. Soc. vol. iii. 1899, p. 235.

1. *Donovania minima* (Mont.).

Var. *pallida*, Jeffr.

Var. *alba*, Jeffr.

I have arranged this genus here in consequence of Mr. M. T. Woodward's paper on the animal and radula, which he has just published.

Fam. 4. *Nassidæ*.

Genus 1. *NASSA*, Lamarck.

1. *Nassa reticulata* (Linn.).

Var. *nitida*, Jeffreys, = *Nassa nitida*, Jeffreys, B. C. iv. p. 399.

2. *Nassa incrassata* (Ström).

3. *Nassa pygmæa*, Lamarck.

Fam. 5. *Columbellidæ*.

Genus 1. *ASTYRIS*, H. & A. Adams.

[*Astyris rosacea* (Gould).]

Buccinum rosaceum, Gould, Silliman's Journal, xxxviii. (1840) p. 197.

Mangelia Hoböllii (Beck), Möller, Ind. Moll. Groenl., Nat. Tidsak. iv. 1842, p. 85.

Buccinum Hoböllii, Waller, Mollusca Antrim Coast, Journ. Roy. Dubl. Soc. ii. (1858) p. 30, pl. i. fig. 1 a-b.

Columbella rosæa, Gould, Invert. Mass., edit. Binney, 1870, p. 357.

Pyrene rosacea, G. O. Sars, l. c. p. 251, pl. xvi. fig. 1.

"N. of Hebrides, 170 fath., C. & T." (Brit. Conch. v. p. 219). This must refer to the 'Lightning' Exped. St. 9, Ann. & Mag. N. Hist. Ser. 7, Vol. iv. 10

which is lat. $60^{\circ} 24' N.$, long. $6^{\circ} 38' W.$, and beyond the British area. It has been dredged, but fossil, on the Turbot Bank, Co. Antrim, by Waller and others; in the Minch by Jeffreys and myself; and off the coast of Aberdeenshire by Mr. R. Dawson.

It is found living on the western and northern coasts of Norway; on the former I have dredged it in the Bergen and Hardanger Fiords, Spetsbergen, Greenland, N.E. coast of N. America, and Alaska. Fossil in the Upper Glacial deposits.]

Genus 2. *ANACHIS*, H. & A. Adams.

1. *Anachis haliæti*, Jeffreys.

Columbella haliæti, Jeffreys, B. C. iv. p. 356.

Pyrene costulata, G. O. Sars, l. c. p. 252, pl. xxiii. fig. 16; Jeffreys, 'Knight Errant,' Proc. Roy. Soc. Edinb. 1882, p. 46.—Nec *Fusus costulatus*, Cantraine, vide Jeffreys, 'Triton,' Proc. Zool. Soc. 1883, p. 392.

Anachis haliæti, Dall, Bull. Mus. Comp. Zool. xviii. 1889, p. 188.

Dredged by Jeffreys and myself about 25 miles N.N.W. of Unst, in 85–95 fathoms, together with a var. *albula* (vide B. C. v. p. 219). 'Lightning,' 1868, St. 14, lat. $59^{\circ} 59' N.$, long. $9^{\circ} 15' W.$, 650 fathoms; 'Porcupine,' 1869, between Galway and the Porcupine Bank; 'Knight Errant,' 1880, St. 7, lat. $59^{\circ} 37' N.$, long. $7^{\circ} 19' W.$, 530 fathoms; 'Triton,' 1882, St. 13, lat. $59^{\circ} 31' N.$, long. $8^{\circ} 18' W.$, 570 fathoms; 'Flying-Fox,' 1889, 1000 fathoms, off the south of Ireland (*E. A. Smith*).

Beyond the British area it was dredged by the 'Porcupine,' 1869, St. 42, lat. $49^{\circ} 12' N.$, long. $12^{\circ} 52' W.$, 862 fathoms; 1870, in the Mediterranean, 1412 fathoms, where it was also procured by the Italian Expedition in 85–544 fathoms. It occurs also in the Bay of Biscay, 'Porcupine' and 'Travailleur'; among the Lofoten Islands and Finmark (*G. O. Sars*), and off the N.E. coast of America, 48–1537 fathoms (*Verrill*).

Fam. 6. *Muricidæ*.

Genus 1. *OCINEBRA*, Gray.

Ocinebra differs from *Murex* in its radula and its operculum.

1. *Ocinebra erinacea* (Linn.), = *Murex erinaceus*, Jeffr.

Var. *tarentina*, Lamarck.

This is the common form in our seas. It is not a "half-grown" state, as Jeffreys says it is (Brit. Conchol. vol. iv.

p. 310), but a form which has the ribs much less strongly developed than more southern specimens.

Var. *tetragona*, J. Sow.

Purpura tetragona, Searles Wood, Crag Moll 1848, p. 38, pl. iv. fig. 7 a d.

In the 'Annals,' 1883, a controversy will be found between Jeffreys and Searles Wood, the former maintaining that this shell was a *Purpura*, the latter that it was a variety of *Ocenebra erinacea*. Searles Wood kindly sent me some of his specimens of this form from Felixstowe, and it appears to me that he was beyond question right in transferring them to this genus.

Var. *melanostoma*, Jeffreys, B. C. iv. p. 218.

Black-mouthed, Jersey (*Dodd*).

What Jeffreys calls var. *sculpta*, B. C. iv. p. 308, I judge, from the description, to be what I consider the type of the species. A remarkable variety which is found further south, but has not yet occurred on our coasts, is the *Murex torosus*, Lamarck.

2. *Ocenebra aciculata* (Lamarck), = *Murex aciculatus*, Jeffr.

In the Channel Islands specimens attain much larger dimensions than any I have seen from the Mediterranean or Madeira.

A genus has been made for this shell, *Ocenebrina*, Jousseaume, 1880, = *Corallinia*, Bucquoy and Dautzenberg, 1882; but it is at most a section of *Ocenebra*.

Genus 2. *Trophon*, Montfort.

1. *Trophon muricatus* (Mont.).

Var. *lactea*, Jeffr.

This variety was dredged by Jeffreys and myself in Hurds Deep, near Guernsey, in 60 fath. I have not seen it from any other locality.

2. *Trophon barvicensis*, Johnston.

I have collected this in many localities on the west coast of Norway; but all the specimens thence are much inferior in size to those from our own seas. Its range has been extended southwards to the coast of Marocco by the 'Travailleur' (*Locard*).

3. *Trophon truncatus* (Ström).

Var. *scalaris*.

This variety, though similar in character, must

not be confounded with var. *Gunneri* of the following species.

Jeffreys (B.C. iv. p. 321) points out the distinctions between this and *T. clathratus*, but in his subsequent papers he united them. It was taken in the 'Lightning' expedition in 530 fath. (St. 12).

[*Trophon clathratus* (Linn.).

Jeffreys, in his account of 'Valorous' Mollusca (Ann. & Mag. Nat. Hist. ser. 4, vol. xix. 1877, p. 325), gives 'Porcupine' Expedition, 1869, off the Hebrides, 165-580 fath. No station has the exact depth of 165, but St. 60 is 167 fath., and 580 fath. is the depth of St. 59; but neither of these two stations is within the British area.]

4. *Trophon carinatus*, Jeffreys.

Trophon carinatus, Jeffreys, Mollusca of 'Triton,' Proc. Zool. Soc. 1883, p. 395, pl. xliv fig. 5.

A fragment thus named, with the following description:— "Shell distinguishable from *T. clathratus* in having a prominent keel in the middle of each whorl; the laminar ribs are fewer and obtusely angulated; the spiral striae, which cover the interstices of the ribs, are numerous, regular, comparatively strong, and flexuous or curved; colour white; inner lip glazed and lustrous. L. (if perfect) 0.6. B. 0.25."

St. 13, lat. 59° 51' N., long. 8° 18' W., 570 fath.

This may, I think, prove to be the *T. lacunellus* of Dall, 'Blake' Mollusca (Bull. Mus. Comp. Zool. xviii. 1889, p. 205, pl. xv. fig. 4), or *T. aculeatus*, Watson, 'Challenger.'

Genus 3. PURPURA, Bruguière.

1. *Purpura lapillus* (Linn.).

Var. 1. *imbricata*, Lamk.

I am indebted to the kindness of Mrs. Stebbing for a reversed monstrosity of *P. lapillus* found by her living on the North Wales coast.

[*Purpura hæmastoma* (Linn.), Jeffr. B. C. iv. p. 283.

I am not aware that the occurrence of this species at Guernsey has been confirmed. It may reasonably be expected there, as it occurs on the opposite coast of France (*P. Fischer*).]

Suborder III. TÆNIOGLOSSA.

Fam. 1. Tritonidæ.

Genus 1. TRITON, Montfort, 1810
(= *Tritonium*, Cuvier).

1. *Triton nodifer*, Lamarck.
2. *Triton cutaceus* (Linn.).

Fam. 2. Cassididæ.

Genus 1. CASSIDARIA, Lamarck, 1812.

1. *Cassidaria rugosa* (Linn.).

Buccinum rugosum, Linn. Mantissa (1771), p. 519

Buccinum tyrrhenum, Chemnitz, Conch.-Cab. (1788), vol. x. p. 192,
pl. clui figs 1461, 1462.

Cassidaria depressa, Philippi, Moll. Sic. vol. ii. (1844), p. 186, pl. xxvii.
fig. 3, *varietas*.

Cassidaria rugosa, Hidalgo, Moluscos de España &c, 1870-82, pl.
fig. 1.

Cassidaria tyrrhena, Bucquoy, Dautzenberg, and Dollfus, Mollusques du
Roussillon, fasc. ii. (1882) pl. ix. fig. 3.

This species was first recorded as a member of our fauna by Mr. G. C. Bourne, who procured two specimens (one of which preserved with the animal in spirits is in my collection) in a trawling-cruise of H.M.S. 'Research' off the south-west of Ireland, lat. $50^{\circ} 29' 26''$ N., long. $11^{\circ} 4'$ W., in 400 fath. In the trawl with it were the fish *Haloporphyrus eques*; the Echinoderms *Spatangus purpureus*, *Echinus norvegicus*, and *Nymphaster subspinosus*; the Crustacea *Bathynectes superbus*, *Ebalia nux*, *Lispegnathus Thomsoni*, *Seyramathea Carpenteri*, *Eupagurus carneus*, and *Parapagurus pilosimanus*; and the Actinozoa *Epizoanthus paguriphilus* and *Actinauge Richardi*; also a living example of another very interesting addition to our molluscan fauna, *Solarium mediterraneum*, Monterosato (see G. C. Bourne, "Report of a Trawling-Cruise in H.M.S. 'Research' off the South-west of Ireland," Journ. Marine Biol. Assoc. United Kingdom, new series, vol. i. 1889-90, p. 306). *Cassidaria rugosa* has been since several times recorded off the same part of Ireland (see Marshall, Journ. Conchol. vol. vii. p. 380).

Distribution. Mediterranean, common. In the Atlantic it has been taken at Guetaria (*Hidalgo*), Cadiz (*Paz*), Bay of Biscay, 'Porcupine' and 'Travailleur' (*Jeffreys*), Belle Ile, Hoedic, and Croisic (*Oaillaud*), off Morocco, 'Talisman' (*Locard*).

This would certainly seem to be the *Buccinum rugosum*, Linn. (nec Gmelin). Hidalgo, in support of this view, draws special attention to the words italicized in the following description of Linné:—"Testa magnitudine ovi, *alba*, striis transversis, *cleratis*, numerosissimis, confertissimis: quarum *sexta* (a sutura spirali) *crassior*, tuberculis constituens cingulum. Spira omnino ovata, acuta. Cauda exserta, leviter ascendens. Labrum marginatum, intus inæqualiter tuberculatum. Labium inferius *late* explanatum, *in ipsa fauce inæquale*. *Crypta*, inter testam et labium interius, *profunda*. Bonanni, Recr. 3, fig. 160."

This description seems clearly to apply to the present species and not to a variety of *Cassidaria echinophorus*. For fuller observations on the subject see Hidalgo's work.

Fam. 3. Cypræidæ.

Genus 1. OVULA, Bruguière, 1789.

Subgenus SIMNIA, Leach, 1829.

1. *Ovula patula* (Pennant).

Genus 2. CYPRÆA, Linné.

Subgenus TRIVIA, Gray.

1. *Cypræa europæa*, Mont.

Genus 3. ERATO, Risso.

1. *Erato larvis* (Donovan).

Marginella larvis, Jeffreys, B. C. iv. p. 400, pl. xcii. fig. 1.

Fam. 4. Aporrhaidæ.

Genus 1. APORRHAIIS (Petiver, 1702), Da Costa.

1. *Aporrhais pes-pelecani* (Linn.).

2. *Aporrhais serresianus* (Michaud).

Rostellaria serresiana, Michaud, Bull. Soc. Linn. Bord. ii. 1828, p. 120, pl. i. figs. 3, 4.

Chenopus serresianus, Philippi, Enum. Moll. Sic. ii. (1844) p. 185, pl. xxvii. fig. 6.

Aporrhais serresianus, G. O. Sais, l. c. p. 192, pl. xxii. figs. 7 a, b, pl. xiii. fig. 4; Norman, Journal of Conchology, ii. (1879) p. 55.

Var. *McAndrewæ*, Jeffr.

Aporrhais pes-carbonis (P Brong.), Forbes & Hanley, Brit. Moll iii p 186, pl lxxxix. figs. 5, 6.

Aporrhais Macandrewæ, Jeffreys, B. C. iv. p. 253, v. pl. lxxx. figs 1, 2.

'Porcupine,' 1869, Stats. 1, 3, 5, 6, 10, 17, 18, 23 *a*, off W. of Ireland, to 1435 fath.; 65, 68, 70, East and West of Shetland; 45 *a*, 45 *b*, S.W. of Ireland, 458 fath.

Jeffreys does not state to which variety the specimens procured by the 'Porcupine' belonged, but in 1870 I dredged on Jeffreys's yacht the 'Osprey,' off Valentia, 112 fath., the typical form closely agreeing with those of the Mediterranean. This same form occurs on the coast of Norway, where I have dredged it at the mouth of Fane Fiord, near Bergen, living in 50-120 fathoms.

The form *Macandrewæ*, which alone was found by Barlee, Jeffreys, and myself in the Shetland seas, measures 31 millim., and I have full-grown specimens which do not exceed 24 millim.; the Valentia specimens are 43 millim. There is considerable variation in the length and form of the digitations. In a Naples specimen in my cabinet the upper spike overtops the spire by half its own length, and in Mediterranean examples the posterior spike has often a large bulbous swelling at half its length.

Fam. 5. **Cerithiidae.**

Genus 1. **CERITHIUM.**

1. *Cerithium procerum*, Jeffreys.

Cerithium procerum, Jeffreys, Ann. & Mag. Nat. Hist. ser. 4, vol. xix.

(1877) p. 322, and Proc. Zool. Soc. 1885, p. 53, pl. vi. figs. 2, 2 *a*.

Cerithium Danielsseni, Friele, Nyt Mag. for Naturvid. 1877, p. 3.

Cerithium procerum, Friele, Jahrbuch deutsch. mal. Gesells. vi. (1879) p. 275.

'Porcupine,' 1869, St. 23 *a*, to the south of Rockall, in 420 fath. 'Lightning,' St. 1, lat. 59° 20' N., long. 7° 5' W., 500 fath., north of Lewis.

Distribution. North Atlantic, 'Valorous,' St. 12, 1450 fath.; 'Vöringen,' from 62° 44' N. to Spetsbergen, in 400-1130 fath. (Friele); 'Porcupine,' 1870, St. 22, off Lisbon, 718 fath.; Jeffreys (Proc. Zool. Soc.) also gives "between the Feroes and Hebrides, 'Triton' cruise"; but it is not mentioned in the account of 'Triton' Mollusca, and therefore the locality may have been north of lat. 60° N.

Genus 2. TRIFORIS, Deshayes.

Subgenus MONOPHORUS, Grillo, 1877 = *Biforina*, B. D. & D. 1884.

1. *Triforis perversa* (Linn.) = *Cerithium perversum*, Jeffreys, B. C. iv. p. 261.

Genus 3. BITTIUM, Gray.

1. *Bittium reticulatum* (Da Costa) = *Cerithium reticulatum*, Jeffreys, B. C. iv. p. 258.

Genus 4. LOVENELLA, G. O. Sars, 1878

(= *Cerithiella*, Verrill, 1882).

1. *Lovenella metula* (Lovén) = *Cerithium metula*, Jeffreys, B. C. iv. p. 256.

'Porcupine,' 1869, Stats. 23 a, to the south of Rockall, in 420 fath.; 65 N.E. of Shetland, 345 fath.; 'Knight Errant,' St. 7, 540 fath., to the west of the "Wyville Thomson Ridge;" 'Triton,' St. 10, in the same district as the last.

Its distribution is Spetsbergen (*Friele*); Norway (*A. M. N.* &c.); Finmark (*G. O. Sars*); Bay of Biscay and off coasts of Spain and Portugal, 'Porcupine,' 1870 (*J. G. J.*).

Genus 5. CERITHIOPSIS, Forbes & Hanley.

1. *Cerithiopsis tubercularis* (Mont.).

Var. *albescens*, Marshall, Journ. of Conchol. vol. vii. (1892-4) p. 259.

Var. *scularis*, Monterosato, id. ib. p. 259.

Var. *acicula*, Brusina, id. ib. p. 259.

2. *Cerithiopsis Barleei*, Jeffreys.
3. *Cerithiopsis pulchella*, Jeffreys.
4. *Cerithiopsis Metaxæ* (Della Chiaje).
5. *Cerithiopsis costulata* (Möller).

Genus 5. LÆOCOCHLIS, Metzger & Mayer.

1. *Læocochlis granosa* (S. V. Wood).

Cerithium granosum, S. V. Wood, Crag Moll. Palæont. Soc. 1848, p. 73, pl. viii. fig. 9.

Triforis McAndrei, H. Adams, Proc. Zool. Soc. 1848, p. 1.

Triforis nivea, M. Sars, Chr. Vidensk.-Selsk. Forhand. 1858, p. 85.

Læocochlis pommeraniae, Dunker & Metzger, Nach. d. deutsch. mal.-zool. Gesellsch. 1874, p. 7, and Nordsee Jahrb. der 'Pommerania,' 1874, pp. 249 & 258, pl. vi. fig. 3, and woodcut p. 264, fig. 3.

Cerithium granosum, Wyville Thomson, Depths of the Sea, 1872, p. 463.

Læocochlis granosa, G. O. Sars, l. c. p. 190, pl. xiii. fig. 6; Jeffreys, Mollusca of the 'Lightning' and 'Porcupine' Expeditions, Proc. Zool. Soc. 1885, p. 52.

In Wyville Thomson's 'Depths of the Sea,' 1873, p. 463, it is stated: "*Cerithium granosum*, S. V. Wood, is also common to Norway and Shetland;" and I myself have a small dead specimen which was given me by my late friend Mr. E. Waller as from "Shetland;" but Jeffreys does not give a station in his report which is in the Shetland Sea. The following, however, establish its claims to be included in our fauna:—"Porcupine," 1869, St. 23 *a*, lat. 56° 18' N., long. 14° 18' W., that is, south of Rockall in 420 fathoms; Stations 89 and 90, which were on the '*Holtenia*' ground, N.W. of the Butt of Lewis, lat. 59° 38' to 41', long. 7° 46' to 34' W., in 445 and 458 fathoms.

It was also taken to the north of our area by 'Lightning,' St. 2, and 'Porcupine,' 1869, St. 65. I have myself dredged it in several places on the west of Norway, and Sars has recorded it from Finnmark. As a fossil it occurs in the Red and Coralline Crags, and also in the Antwerp Crag.

BIBLIOGRAPHICAL NOTICES.

Insects, their Structure and Life. A Primer of Entomology. By GEORGE H. CARPENTER, B.Sc. Lond. Pp. xi, 404. London, J. M. Dent & Co.

In this useful little book Mr. Carpenter has given a sketch of the structure of insects in general (the cockroach being taken as a typical example), and an abstract of the classification, structure, habits, and pedigree of insects, not forgetting to add a Bibliography and Index. Although the book does not profess much originality, it is well arranged, and contains a large amount of information which it would require much time and trouble to collect elsewhere, even with the aid of the bibliography which Mr. Carpenter has appended to his work. The non-technical portions (those dealing with habits, evolution, pedigree, &c.) are written in a very clear and pleasing style, and may interest many readers who might not care for the more technical parts of a work on entomology; for the subject is so vast and varied that it presents ample materials for study, equally to the systematist, the comparative anatomist, the field naturalist, the geologist, the philosopher, and the amateur who wishes for as much general superficial knowledge of everything as he can obtain.

It is not to be supposed that a book of such a comprehensive character can be free from error; but although we may not always agree with the author's conclusions, we have not noticed anything which we should be disposed to regard as seriously detracting from its value. The amount of space devoted to different parts of the subject, the reliability and real importance of various observations and experiments, the mutual affinities of different families of insects, the probable number of existing species of insects, and the problems of Evolution and Geographical Distribution are all subjects on which no general consensus of opinion can at present be expected.

We should mention that the numerous illustrations, though not original, are taken from a variety of sources, many of which are not very easily accessible, and a considerable number from American periodicals.

There is much work still to be done in entomology, and as each generation of entomologists starts with far greater facilities for work than their predecessors have enjoyed, it is from the younger entomologists, like Mr. Carpenter, that we may confidently expect a large increase of our knowledge of the insect-world.

Cries and Call-notes of Birds: with Musical Illustrations.

By C. A. WITCHELL. 8vo. Upcott Gill, 1899.

THE study which Mr. Witchell has for years past devoted to the songs and notes of birds, and his musical training, have fitted him beyond all other ornithologists to produce a reliable popular work on the subject.

To those who have read with pleasure Mr. Witchell's most fascinating book 'The Evolution of Bird-Song,' the present more modest little work will be welcome; it occupies only eighty pages, but these are crowded with information. The effort to record the Nightingale's song in musical notation is a marvel of patient effort and indomitable pluck on the part of the author. We would recommend all lovers of British birds to spend a shilling in securing this valuable addition to their libraries.

MISCELLANEOUS.

Parthenogenesis. By THOMAS MERRHAN.

It is about two hundred years ago since Camerarius recorded the fact that female mulberries and other trees would produce fruit without pollinization, though such fruit was sterile. These observations have since been abundantly confirmed. The necessity of pollen to fertile seed came to be regarded as absolute law until some fifty years ago, when the Curator at Kew, Mr. John Smith, announced that an Australian plant of which he had but one female specimen perfected its seeds. It proved to be a new Euphorbiaceæ, and he named it *Oclobogynë ilicifolia*—the generic name from its supposed parthenogenetal character.

The author of this paper was a student in Kew at that time, and well remembers the incredulity with which the announcement was received, that nature should seem to make a universal law in relation to method of reproduction, and yet make a striking exception in this case. Nature furnishes infinite variation, but these variations seem to be only of one general plan. It seemed more probable that, in some method unexplained, pollen had been formed, and really pollinated the embryo. It does not appear that any further observations on this plant were made at Kew, or, if made, recorded.

Strasburger took up the subject again in 1878; but though my good friend Mr. George Nicholson, Curator of Kew, writes under date of April 10, 1897, that "the whole business has been threshed out by Strasburger," the latter seems to be more concerned about

the cell-development than the manner of its fertilization. This is especially true of that part devoted to the castor-oil plant, *Ricinus communis*. In *Celebogynne* he insists that the true embryo does not develop, but that the seeds proceed from adventitious buds from the wall of the ovary. One may conceive of them as bulblets, analogous to what we find in viviparous flowers; but he does not explain how cotyledonous seeds are constructed in this way.

In 1894 the author of this paper decided to make for himself careful observations on *Ricinus*. A number of plants were set out in a mass where he could easily watch them. Every male bud that could be observed was rubbed away before expansion. For all this an abundance of seed matured. It was found subsequently that there were other plants within a quarter of a mile. It was thought best to repeat the observations another year. The following year no plants were near but those under observation, and it began to look as if the plants had no use for pollen. Still there seemed doubt, and the observations were continued yearly to the end of 1897—all with the same result. Dr. Ida A. Koller, Professor of Biology in the Philadelphia Girls' High School, an experienced microscopist, aided me considerably in the observations made, and only for the fact that in one of her acute examinations she discovered a pollen-tube at work on the ovarium, there would have seemed no room for doubt that pollen was unnecessary for the production of perfect seed in *Ricinus*. It was determined to try once more. The past year (1898) only one plant was allowed to grow and only one flower-spike permitted to remain. All the others were cut away in the bud. This permitted closer examination, which was made almost daily. I noted for the first time that there were on the pedicels with the female flowers buds scarcely larger than pin-heads, and, under a strong lens, evidently antheriferous. These were carefully cut away. As the female flowers opened they all withered, unlike their fertility in former years. There seemed no doubt that pollen was essential. After half the spike had fallen away, the upper portion—say some twenty flowers—showed a disposition to permanence. The pretty fringed pistils protruded and continued perfect for many days. Finally, the capsules enlarged until they had about reached the usual dimensions. Now it seemed as if the plant would produce seed without the aid of pollen. After turning brown and seemingly ripe they were found to be as empty as Camerarius's mulberries were.

While under the impression during the earlier years of these observations that *Ricinus* was fruiting in the absence of pollen, I was encouraged by observations seemingly confirmatory by Judge Day, of Buffalo, and Prof. Greene, of Washington, on other plants. At the same time I had noticed that solitary female plants of *Ginkgo biloba* were fruiting abundantly in Germantown, while the only known male plant was at Woodlands, some ten miles away. Recently Japan botanists have discovered spiral coils of spermatozoids in the generative cells of *Ginkgo*, and others have observed them in *Cycas revoluta*.

The conclusion reached by the author is that though for several

years he regarded the castor-oil plant, *Ricinus communis*, as a genuine case of parthenogenesis, the past year's experience still leaves the matter open to doubt. If it be true that the female flowers of *Cycas revoluta* can generate spermatozooids in their ovaries, and thus self-fertilize the ova, the occurrence must be rare. In this vicinity old specimens of this plant are frequently seed-bearing apparently, but in every case examined by the author they were found to have only empty capsules.

It seems to the author that the subject of parthenogenesis is by no means thoroughly "threshed out," and the object of this paper is to encourage continued observations.—*Proc. Acad. Nat. Sci. Philad.* 1899, pp. 97-99.

Relations of the Land-Molluscan Fauna of South America.

At a meeting of the Academy of Natural Sciences of Philadelphia on the 23rd May, 1899, Mr. H. A. Pilsbry spoke of the extrinsic relations of the land-molluscan fauna of South America, recounting and commenting upon the various theories advanced to account for the relations existing between the South-American, African, and Australo-Zealandic faunas. The evidence of former Austral land connecting South America with Australasia, derived from a study of the Bulimulidæ, the Macroogona, &c., was detailed. The speaker gave his reasons for preferring the hypothesis of a former extension of Antarctic land to that of a South-Pacific continent, as advocated by Prof. Hutton* and some others. He claimed that the present fauna of Southern Polynesia was not consistent with Hutton's supposition that these islands had been submerged, and thus their fauna destroyed, on the sinking of the supposed Pacific continent entirely below the sea, the present "islands being merely outgrowths on its submerged back." Some Polynesian groups, such as *Partula*, belong to very primitive, and therefore ancient, groups, unknown in any other area, and indicating great antiquity for the Polynesian archipelagos†. Neither is the present fauna of Polynesia consistent with the hypothesis that these islands are unsubmerged remnants of a Pacific continent.

The enigmatic relations of the freshwater fishes, snails, and the terrestrial Streptaxidæ of tropical South America with the African fauna were discussed.

The speaker considered the neotropical region of Wallace to be composite, the Antillean and Southern Mexican area representing a tract independent from North and South America in Mesozoic and perhaps earlier time, on which the faunal problems had been independently worked out.—*Proc. Acad. Nat. Sci. Philad.* 1899, p. 226.

* See *Proc. Linn. Soc. New South Wales*, 1896, p. 30, for an able paper advocating Prof. Hutton's views, an abstract of which appeared in the 'Annals' for July 1896, p. 120.

† *Partula*, like the allied *Achatinella* of the Hawaiian group, has a bottle-shaped kidney with direct, not reflexed, ureter, as in *Limnaea*. These forms have no relation with the Bulimulidæ and Achatinidæ, with which conchologists associate them, but lie at the base of the terrestrial pulmonate tree.

THE ANNALS
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[SEVENTH SERIES]

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XIV.—*Key to the Isopods of the Pacific Coast of North America, with Descriptions of Twenty-two new Species.* By HARRIET RICHARDSON*.

THE Isopods of the Pacific coast of North America have claimed the attention of a number of naturalists during the last half of the nineteenth century. Among the first to contribute to the knowledge of the fauna of that region was Dana. Stimpson also belongs to the earlier part of that period; his work on the Crustacea and Echinodermata of the Pacific shores of North America, published in 1857, was the first special treatise on the forms of that locality. In connexion with the work of the later part of the past fifty years, the names of Stuxberg, Lockington, and Harford form one group as contemporaneous workers (1875-76), those of Schiödte and Meinert and Budde-Lund another group (1883-85), while the publications of Dr. Hansen and Dr. Benedict represent the latest (1898) work on the Isopods of that coast.

The number of species already described is 75, and 22 are added in the present paper. These species represent 14 genera and 16 families †.

The author has used Dr. Benedict's keys for the genera *Synidotea* and *Aroturus*, and is indebted to Professor Sars for

* From a separate copy from the 'Proceedings of the United States National Museum,' vol. xxi. pp. 815-869 (1899).

† [The index-list of tribes &c. is here omitted.]

many suggestions obtained from his excellent work on the Crustacea of Norway. In many places his synopses of the families and genera have been used in entirety. Other authors have been most helpful: Hansen on the Cirrolanidæ; Schiödte and Meinert on the Cymothoidæ; Budde-Lund on the Oniscidæ; and others, to whose works specific references are made.

The present paper is based on material contained in the U.S. National Museum.

Analytical Key to Tribes or Superfamilies of Pacific Coast Isopoda.*

- a. Legs of first pair cheliform. Uropoda terminal.
Pleopoda, when distinctly developed, exclusively natatory. I **Chelifera.**
- a'. Legs of first pair not cheliform.
- b. Uropoda lateral.
- c. Uropoda forming together with the terminal segment of the meta-soma a caudal fan.
Pleopoda for the most part natatory. II. **Flabellifera.**
- c'. Uropoda valve-like, inflexed, arching over the pleopoda, which to a great extent are branchial. III **Valvifera.**
- b'. Uropoda terminal.
- c. Free forms.
- d. Pleopoda exclusively branchial, generally covered by a thin opercular plate (the modified first pair) IV. **Asellota.**
- d'. Pleopoda fitted for air-breathing. V. **Oniscoidea.**
- c'. Parasitic forms VI. **Epicaridea.**

I. CHELIFERA.

Family I. Tanaidæ.

Body scarcely attenuated behind. Mandibles without palp. Coxal plates inconspicuous. Superior antennæ with one multiarticulate flagellum. Anterior maxillæ with only a single masticatory lobe; posterior ones quite rudimentary. Second pair of legs ambulatory in character. Epignath of maxillipeds narrow, falciform.

1. TANAIS, Audouin & Milne-Edwards.

Antennæ short, subequal. Pleon five-jointed; fourth joint short; fifth joint terminated by a pair of single branched filamentary uropoda. Only three pairs of pleopoda. Palp of anterior maxillæ biarticulate. Eyes well developed. Superior antennæ three-articulate, with small terminal flagellum.

* Sars's analytic key has been used with slight modifications. Sars's 'An Account of the Crustacea of Norway,' II., Isopoda (1896), pts. i., ii. p. 3.

Analytical Key to the Species of Tanais.

- a. Inferior antennæ scarcely half the length of superior antennæ. Pereiopoda having the first three joints short and broad, affixed to sides of pereon like plates of mail. 1 *T. loricatus*, Spence Bate.
- a'. Inferior and superior antennæ of nearly equal length. Pereiopoda with joints not dilated, slender 2 *T. alascensis*, sp. n.

1. *Tanais loricatus*, Spence Bate.

Tanais loricatus, Spence Bate, Lord's Naturalist in British Columbia, ii. (1866), p. 282

Hab. Esquimault Harbour, British Columbia.

2. *Tanais alascensis*, sp. n.

Body three and a half times longer than broad.

Head large, narrower anteriorly. Frontal margin almost straight. First pair of antennæ short, stout, consisting of four joints, the first joint being the longest. Second pair of antennæ more slender, a little longer, consisting of four joints, the first joint being longest, and a rudimentary flagellum. Eyes small and pedunculated.

The first segment of the thorax is confluent with the head. The second, third, fourth, and fifth segments increase slightly in length; the fifth and sixth are about equal; the seventh is not quite so long as the preceding one.

The abdomen is composed of five segments, the first three of which are subequal; the fourth is short, about half as long as any of the others and also narrower; the terminal segment is as long as the two preceding ones together, and is rounded posteriorly, with a slight median notch. The segments of the abdomen decrease in width gradually from the first to the terminal segment. The terminal filaments are seven-jointed and single-branched, and are furnished at their extremities with a few long hairs.

The first pair of legs are stout and chelate; the propodus is produced into a

Fig. 1.



a



b

Tanais alascensis, sp. n.
 × 8. a, dorsal view;
 b, last two joints of
 leg of the first pair.

strong immovable finger, irregular in shape, having its central portion raised and truncate on its upper surface, which is distinctly serrate. The dactylus is likewise serrate on its inner surface. The other legs are slender, with a gradual increase in stoutness.

Colour brown, marked in some specimens with a darker brown, and having oval patches of the darker colour on the head.

Kyska Harbour, Alaska; Mr. W. H. Dall collector; depth 6 to 8 fathoms.

Type. No. 22563, U.S. N. M.

II. FLABELLIFERA.

Analytical Key to the Families of Flabellifera.

a. Pleon consisting of six segments.

b. Uropoda with one of the branches almost obsolete or rudimentary, not lamelliform

II LIMNORIIDÆ

b' Uropoda with both branches developed; mostly lamelliform.

c* Maxillipeds with the palp free, the margins of the last two joints more or less setose, never furnished with hooks.

d Mandibles with the rather broad, more or less tridentate cutting-edges meeting squarely behind the large upper lip, the secondary plate and peculiar equivalent for the molar well developed. First maxillæ having the plate of the first joint armed with three spines, that of the third with many. Second maxillæ of moderate size, the three free plates very setose. Maxillipeds with the palp rather broad, very setose.

III CIROLANIDÆ.

d'. Mandibles with the distal part produced into a long prominent process, the pair much overlapping; the secondary plate and molar evanescent. First maxillæ having the plate of the first joint unarmed, of the third carrying one very long spine. Second maxillæ small and feeble, the free plates almost rudimentary, with few setæ. Maxillipeds with the palp narrowed, not very setose

IV. CORALLANIDÆ.

c'. Maxillipeds with the palp embracing the cone formed by the distal parts of the

* The four points following b' are taken from Hansen's analytic key of the Cirrolanidæ (Vidensk. Selsk. Skr. 6th ser., natur. og math. Afd. v. 1890, p. 317), as translated by Stebbing, Hist. of Crust. 1893, pp. 340, 341.

mouth-organs, the inner upper margin and apex never setose, the apex and sometimes the inner upper margin, at least in the males and females without eggs, being furnished with outward curved hooks.

d. Mandibles with the secondary plate very often visible; palp with no inflated joint. Maxillipeds commonly seven-jointed, sometimes four-jointed, the last joint in the latter case rather short, obtuse. Antennae * long, unequal, with well-defined peduncle and flagellum

V. *ÆGIDÆ*.

d'. Mandibles with no secondary plate; the palp in adults with first joint or both first and second joints inflated. Maxillipeds always four-jointed, last joint rather long and narrow, subacute. Antennae * much reduced, without clear distinction between peduncle and flagellum

VI. *CYMOTHOIDÆ*.

a'. Pleon consisting of less than six segments.

b. Pleon with two segments. Uropoda with one branch fixed, immovable

VII. *SPHÆROMIDÆ*.

b'. Pleon with four segments. Uropoda with both branches movable

VIII. *SEROLIDÆ*.

Family II. *Limnoriidæ*.

2. *LIMNORIA*, Leach.

3. *Limnoria lignorum* (Rathke).

Cymothoa lignorum, Rathke, Skrivt. af Naturh. Selsk. v. 1799, p. 101, pl. iii. fig. 14 (White).

Limnoria tenebrans, Leach, Ed. Encycl. vii. 1813, p. 433 (Am. ed. p. 273); Trans. Linn. Soc. xi. 1815, p. 371; Dict. Sci. Nat. xii. 1818, p. 353; Desmarest, Consid. Crust. 1825, p. 312; Latreille, Règne Anim. iv. 1829, p. 135; Edwards, Annot. de Lamarck, v. 1838, p. 276; Hist. Nat. des Crust. iii. 1840, p. 145; Règne Anim., Crust. 1849, p. 197, pl. lxxvii. fig. 5; Gould, Invert. Mass. 1840, pp. 338 354; Verrill, Proc. Am. Assoc. 1873 (1874), p. 367.

Limnoria lignorum, White, Pop. Hist. Brit. Crust. 1857, p. 227, pl. xii. fig. 5; Bate, Rep. Brit. Assoc. 1860 (1861), p. 225; Bate & Westwood, Brit. Sess. Crust. ii. 1868, p. 351; Norman, Rep. Brit. Assoc. 1868 (1869), p. 288; Verrill, Am. Journ. Sci. 3rd ser., vii. 1874, pp. 133, 135; Proc. Am. Assoc. 1873 (1874), p. 371; Report U.S. Commissioner of Fish and Fisheries, 1874, pt. i. p. 379 (85); Harger, Report U.S. Commissioner of Fish and Fisheries, 1874, pt. i. p. 571 (277), pl. vi. fig. 25; Proc. U.S. Nat. Mus. ii. 1879, p. 161; Stebbing, Trans. Devon. Assoc. 1874, p. 8; Ann. & Mag. Nat. Hist. ser. 4, xvii. 1879, p. 79; Smith, Proc. U.S. Nat. Mus. ii. 1879 (1880), p. 232, fig. 2.

* Inserted by author.

Limnoria uncinata, Heller, Verh. k. k. zool.-bot. Ges. Wien, xvi. 1866, p. 734.

Limnoria lignorum, Harger, Report U.S. Commissioner of Fish and Fisheries, 1878, pt. iv. pp. 373, 376. (See Harger for further synonymy.)

Limnoria californica, Hewston, Proc. Cal. Acad. Sci. v. 1874, p. 24 (nomen nudum).

Hab. Pacific Ocean; Bering Island. Also found on east coast of North America from Florida to Halifax, on the coast of Great Britain, and in the North Sea. Specimens from San Diego, California, collected by Mr. Henry Hemphill and labelled "*Limnoria californica*, Hewston," are in the National Museum.

Family III. Cirolanidæ.

Analytical Key to the Genera of Cirolanidæ *

- a. Peduncle of second antennæ two-jointed. Plate of second joint of maxillipeds furnished with hooks. First and second pleopods alike, with at least inner branch submembranaceous. Uropoda with inner angle of peduncle produced 3. *Cirolana*.
- a'. Peduncle of second antennæ four-jointed. Plate of second joint of maxillipeds without hooks. Pleopoda with both branches submembranaceous. Uropoda with inner angle of peduncle very little produced. Superior antennæ with first joint of peduncle quite short, and extended straight in front at a right angle to remaining part of the antenna 4. *Eurydice*.

3. CIROLANA, Leach.

Analytical Key to the Species of Cirolana.

- a. Head without median process. First pair of antennæ reach apex of peduncle of second pair of antennæ. Terminal abdominal segment subtriangular, armed on its posterior margin with twenty-six spines. Both branches of the uropoda rounded posteriorly and armed with spines 4. *C. Harfordi* (Lockington).
- a'. Head with long, straight, median projection. First pair of antennæ reach the posterior margin of the third thoracic segment. Terminal abdominal segment rounded and crenulate on its posterior margin, and fringed with long hairs. Inner branch of the uropoda obliquely truncate posteriorly .. 5. *C. linguifrons*, sp. n.

* The characters in this key on the Cirolanidæ are taken from Stebbing, 'History of Crustacea' (1893), p. 342.

4. *Cirolana Harfordi* (Lockington).

Æga Harfordi, Lockington, Proc. Cal. Acad. Sci. vii. 1877, pt. i. p. 46.

Cirolana californica, Hansen, Vidensk. Selsk. Skr. 6th ser., natur. og math. Afd. v. 1890, pp. 338, 339.

Hab. Victoria, British Columbia. California: Santa Rosa Island, San Diego, Catalina Harbour, Pacific Grove, Monterey Bay; Lower California, specimens lighter in colour.

Miers* remarks upon having examined specimens of *Æga Harfordi*, sent by Mr. Lockington to the British Museum and designated *Idotea Harfordi* in a manuscript note of the author. He considers that the specimens belong to the genus *Cirolana* or a closely allied type, without further identifying them. Hansen† also states that, according to Miers, *Æga Harfordi* is probably a *Cirolana*. He had not seen Lockington's description, but followed Miers regarding the systematic position of the species.

Specimens of *Æga Harfordi* were sent by Mr. S. J. Holmes to the National Museum from the California Academy of Sciences, which prove to be identical with *Cirolana californica*, Hansen.

5. *Cirolana linguifrons*, sp. n.

Colour yellow, marked with scattered black dots. Body elongate-ovate, about five times longer than broad, greatly convex.

Fig. 2.



Cirolana linguifrons. $\times 18\frac{1}{2}$. a, head; b, terminal segment.

Head with the frontal margin produced in a long straight process, rounded anteriorly, and somewhat dilated. Eyes large, distinct. First pair of antennæ with joints of the peduncle large; flagellum of fifteen short joints extends to the posterior margin of the third thoracic segment. Second

* Miers, Journ. Linn. Soc. London, xvi. 1883, p. 19.

† Hansen, Vidensk. Selsk. Skr. 6th ser., natur. og math. Afd. v. 1890, pp. 338, 339; for synonymy see p. 357.

pair of antennæ, with a flagellum of thirteen long joints, extend to the posterior margin of the fifth thoracic segment.

The first three segments of the thorax are short; the other four segments are long. The epimera of the second, third, and fourth segments are not produced at the apex; those of the fifth, sixth, and seventh but slightly produced.

All the abdominal segments conspicuous, the first five being of equal length. The terminal segment is rounded posteriorly, faintly crenulate, and fringed with long hairs. The base of this segment is raised above the other portion and has a well-defined edge with two points extending backward, one on either side of the median line. The uropoda extend beyond the tip of the abdomen; the inner branch is obliquely truncate; the outer branch is more rounded; both branches are fringed with long hairs.

The prehensile legs are short, the gressorial legs are long and slender. The legs increase gradually in length from the first to the seventh pair.

Two specimens, from Monterey Bay, California, collected by Mr. Heath from sandy shore at mean tide.

Type. No. 22564, U.S. N. M.

4. EURYDICE, Leach.

6. *Eurydice caudata*, sp. n.

Body elongate and narrow. In male abdomen is equal in length to thorax; in female it is shorter. Surface of body smooth.

Head widely rounded in front; its anterior margin narrowly thickened. Eyes large and round, and situated at a distance of one third the width of the head apart. First pair of antennæ extend to the posterior margin of the head; flagellum contains five articles, the first of which is very long and those following quite short. The second pair of antennæ extend as far as the posterior margin of the fourth segment of the abdomen; the flagellum consists of twenty-five long slender joints. In the female the second pair of antennæ are much shorter, reaching only to the posterior margin of the last thoracic segment; the flagellum contains about twenty joints.

The thoracic segments are subequal. The epimera are narrow, and those of the last three or four segments acutely pointed.

All the abdominal segments are visible in a dorsal view. The terminal segment is rounded at the sides and truncate at

its extremity, the lateral angles being produced in a short triangular process, between which the posterior margin is distinctly denticulate and bears four spines, which are about twice as long as the lateral teeth. The uropoda are short, not reaching the extremity of the terminal segment, are truncate and crenulate on their posterior margins. The uropoda, as well as the terminal segment, are fringed with short hairs.

The legs are long and slender and armed with many spines.

Colour light brown marked with black spots.

Individuals of this species were collected at Isthmus Cove, Catalina Island, California, by the U.S. Fish Commission steamer 'Albatross.'

Type. No. 22565, U.S. N. M.

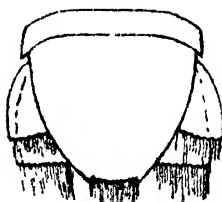
This species resembles *E. Grimaldii*, Dollfus *, more closely than it does any other species of the genus. It differs in the following characters:—

1. The greater number of joints in the flagellum of the first pair of antennæ. In our species there are five joints, while in *E. Grimaldii* the flagellum is uniaarticulate.

2. In the fewer number of joints in the flagellum of the second pair of antennæ. In our species there are only twenty-five, while in *E. Grimaldii* the flagellum contains thirty-two articles.

3. In the presence of four spines on the posterior margin of the terminal segment. In *E. Grimaldii* the posterior margin is denticulate; in our species it is denticulate and also bears four spines.

Fig 3.



Eurydice caudata Last two abdominal segments, greatly enlarged.

Family IV. Corallanidae.

5. *CORALLANA*, Dana.

7. *Corallana truncata*, sp. n.

Body elongate, about three and a half times longer than wide; colour yellow.

* Bull. Soc. Zool. France, xiii. 1888, pp. 35, 36; "Sur quelques Crustacés Isopodes du Littoral des Açores," A. Dollfus.

Head with a small median point. Eyes large, situated but a little distance apart. First pair of antennæ, with a flagellum of about nine articles, extend to the antero-lateral angle of the first thoracic segment. Second pair of antennæ broken in specimen.

Fig. 4

*Corallana truncata* $\times 13\frac{1}{2}$.

a, head; b, abdomen and last thoracic segment

First segment of the thorax is as long as the head, and about one and a half times longer than any of the other segments. Epimera of the second and third segments narrow; those of the remaining segments very broad.

The first abdominal segment is almost entirely covered by the last thoracic segment. The second, third, and fourth segments are tuberculated on their posterior margins. The fifth segment is also tuberculated, the tubercles on either side of the median line of tubercles being larger and more conspicuous. At the base of the terminal segment are four tubercles, the two centre ones being the larger. The terminal segment is subtriangular with truncate apex. The posterior margin is armed with spines. The inner branch of the uropoda is truncate posteriorly and armed with spines; it is about twice as broad as the outer branch, which is lanceolate in shape.

There is but one specimen, from Catalina Island, California; collected by Dr. J. G. Cooper.

Type. No. 22566, U.S. N. M.

Family V. *Ægidæ*.

Analytical Key to the Genera of Ægidæ.

- a. Body rather compact. Superior antennæ short, with first two peduncular joints more or less expanded. Epistome large, linguiform, projecting between the bases of inferior antennæ. Maxillipeds with palp composed of five joints. Anterior pairs of legs with propodus simple, cylindrical, not expanded, dactylus abruptly curved in middle. Front separating the whole or a great part of the first article of the first pair of antennæ. Flagellum of first pair of antennæ composed of many articles. Abdomen compact. . . 6. *Æga*.

- a'. Body more depressed than in *Æga*. Superior antennæ short, with basal joints not expanded. Epistome very small and narrow. Maxillipeds with palp composed of only two joints. Anterior pair of legs with propodus more or less expanded, dactylus forming a very large and evenly curved hook. Front covering more or less the peduncle of the first pair of antennæ. Flagellum of first pair of antennæ composed of four to six articles. Abdomen relaxed 7 *Rocinela*.

6. *ÆGA*, Leach*Analytical Key to Species of Æga.*

- a. Eyes very small; second joint of first pair of antennæ without process at its apex; terminal abdominal segment triangular, with rounded apex; inner branch of uropoda with apex faintly arcuate obliquely 8. *Æ. microphthalma*, [Dana.]
- a'. Eyes almost contiguous; second joint of first pair of antennæ with a process at its apex nearly as long as following joint; terminal abdominal segment with its apex arcuate-truncate; inner branch of uropoda subtruncate 9. *Æ. Lecontii* (Dana).

8. *Æga microphthalma*, Dana.

Æga microphthalma, Dana, Proc. Acad. Nat. Sci. Philad. vii. 1854, p. 176; Stimpson, Journ. Bost. Soc. Nat. Hist. vi. 1857, p. 68.

Hab. Monterey, California.

9. *Æga Lecontii* (Dana).

Ægacylla Lecontii, Dana, Proc. Acad. Nat. Sci. Philad. vii. 1854, p. 177; Stimpson, Journ. Bost. Soc. Nat. Hist. vi. 1857, p. 69

Hab. California.

Body elongate, oval; surface smooth; colour yellow, with a few brown dots; eyes reddish brown.

Head with anterior margin bisinuated, the median point separating the basal joints of the first pair of antennæ and extending one third the length of these joints. Eyes large, oval, very close together at upper inner angle. First pair of antennæ with basal joints very large, dilated; second joint of peduncle dilated, and with a process at its apex extending nearly the length of the third joint; third joint very narrow, about one third the width of two preceding joints; flagellum, composed of seven joints, extends the length of the peduncle of second pair of antennæ. Second pair of antennæ, with a

flagellum of twelve joints, extend almost to the posterior margin of the first thoracic segment.

The last four thoracic segments are each a little longer than any of the first three. The epimera are narrow, with rounded post-lateral angles.

The five abdominal segments are of equal length. The terminal segment is subtriangular, with truncate extremity; its posterior margin is crenulate and fringed with hairs. The uropoda exceed slightly the length of the abdomen. The inner branch is about twice as wide as the outer branch; is obliquely truncate and crenulate. The outer branch is narrow, rounded posteriorly, and smooth. Both branches are fringed with hairs.

The legs are long and slender. Five spines are present on the merus of the prehensile legs. The gressorial legs are but slightly spinulose.

Two specimens examined were collected at Monterey Bay, California, by Mr. Heath.

The description of this species of *Æga* by Dana as *Ægacylla Lecontii* was from a young specimen*. The individual sent us is thought to be the adult form, and differs from Dana's description† of the young individual in the crenulated posterior margin of the terminal segments, in the truncated inner branch of the uropoda, and in the addition of two joints to the length of the flagellum of the second pair of antennæ.

Fig. 5.

*Æga Lecontii* (Dana). × 2.

7. ROCINELA, Leach.

Analytical Key to the Species of Rocinela.

- a. Flagellum of second pair of antennæ with fourteen to sixteen joints.
- b. Propodus of prehensile legs with two to four spines.

* Schiödte and Meinert regard *Ægacylla*, Dana, as synonymous with *Æga*, and remark that Dana's specimen, by which the genus *Ægacylla* was instituted, was a young *Æga*. See 'Naturhistorisk Tidsskrift,' xii. 1879-80, p. 334. See also Lütken, Vid. Medd. Naturh. For. 1860, p. 180.

† There are no specimens of the young in the National Museum.

- c. First thoracic segment with antero-lateral angles produced horn-like at sides of head. Frontal margin of head produced. Spots wanting on fourth and fifth abdominal segments and base of terminal segment 10. *R. cornuta*, Richardson.
- c'. First thoracic segment normal. Frontal margin of head not produced. Spots present on fourth and fifth abdominal segments and base of terminal segment 11. *R. belliceps* (Stimpson)
- b' Propodus of prehensile legs with five or six spines 12. *R. laticauda*, Hansen.
- a'. Flagellum of second pair of antennæ with ten to eleven joints. 13. *R. tuberculosa*, Richardson
- b. Tubercles developed on all the segments of the body 14. *R. arvensis*, Schiodte & Meier. [nert.]
- b'. No tubercles developed on body. Terminal segment of body ornamented with a very wide crescentiform band, from whose posterior border three large hastiform stripes project backwards

10. *Rocinela cornuta*, Richardson.

Rocinela cornuta, Richardson, Proc. Am. Phil. Soc. xxxvii. 1898, p. 12, figs. 1, 2.

Hab. Off Shumagin Bank, Alaska.

11. *Rocinela belliceps* (Stimpson).

Æga belliceps, Stimpson, Proc. Acad. Nat. Sci. Philad. xvi. 1864, p. 155.

Æga alaskensis, Lockington, Proc. Cal. Acad. Sci. vii. 1877, pt. i. p. 46.

Rocinela alascensis, Richardson, Proc. Am. Phil. Soc. xxxvii. 1898, p. 11.

Hab. Cortes Bank, California, to Alaska and Bering Sea.

12. *Rocinela laticauda*, Hansen.

Rocinela laticauda, Hansen, Bull. Mus. Comp. Zool. xxxi. 1897, no. 5, pp. 108, 109; Richardson, Proc. Am. Phil. Soc. xxxvii. 1898, pp. 14, 15, figs. 5, 6.

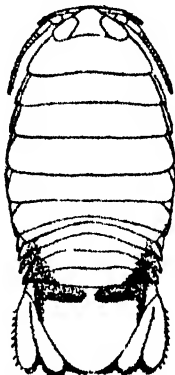
Hab. Off Acapulco; near Tres Marias Islands; off Mazatlan; off San Luis Obispo Bay, California; off Esteros Bay, California; Puget Sound, Washington; Unimak Island, Alaska.

13. *Rocinela tuberculosa*, Richardson.

Rocinela tuberculosa, Richardson, Proc. Am. Phil. Soc. xxxvii. 1898, p. 16, fig. 10.

Hab. Southern part of Gulf of California.

Fig. 6.



Rocinela belliceps (Stimpson). $\times 2\frac{1}{2}$.

14. *Rocinela aries*, Schiödte & Meinert.

Rocinela aries, Schiödte & Meinert, Naturhistorisk Tidsskrift, xii. 1879-80, pp. 401-403, pl. xiii. figs. 7, 8.

Hab. Mazatlan; Lower California; Panama Bay.

Family VI. Cymothoidæ.

Analytical Key to the Genera of Cymothoidæ.

a. Head deeply immersed or set in the first thoracic segment, whose antero-lateral angles project forward.

b. Abdomen deeply immersed.

First pair of antennæ more often dilated, rarely compressed. First four or five segments of body long, subequal in length, except the first, which is a little longer; last two or three segments abruptly shorter, very often decreasing gradually in length. Terminal segment of abdomen subtriangular or semicircular, often bilobed. Body oblong

8. *Meinertia*.

b'. Abdomen scarcely immersed.

First pair of antennæ very much compressed. Segments of thorax either equal in length or the first segment abruptly longer than the others and the last segment abruptly shorter than the others. Terminal segment of the abdomen varying in size and form. Body suboval, more or less contorted.

9. *Lia*.

a'. Head not at all immersed.

b. Body relaxed. Posterior angles of first segment of body prominent or produced, very often acute; posterior angles of the following segments increasing gradually in length, the first of these very often scarcely prominent, the posterior ones very often produced, abruptly longer than the first. Epimera of the first segments very often involuted, and extending beyond the posterior angle of the segment; posterior ones produced, acute. Sides of the first five segments of abdomen more or less profoundly incised

10. *Nerocila*.

b. Body compact. Posterior angles of first segment of body scarcely prominent, occasionally produced, those of following five segments scarcely or not at all prominent; those of seventh segment produced. Epimera of first segments very often almost reaching, or not reaching by a short distance, the posterior angle of the segment. Sides of the first segments of the abdomen whole or obscurely emarginated, of the posterior ones gradually more profoundly emarginated or incised

11. *Anilocera*.

8. MEINERTIA, Stebbing*.

15. *Meinertia Gaudichaudii* (Milne-Edwards).

Cymothoa Gaudichaudii, Milne-Edwards, Hist. Nat. Crust. iii. 1840, p. 271.

Ceratothoa rapax, Heller, Reise Novara, Crust. xii. p. 140, fig. 17.

Ceratothoa Gaudichaudii, Schiödte & Meinert, Naturhistorisk Tidsskrift, xiii. 1881-83, pp. 335-340, pl. xiii. figs. 11-15.

Hab., Mazatlan.

9. LIVONECA, Leach.

Analytical Key to the Species of Livoneca.

a. Terminal segment obscurely carinated, and sides infolded. Caudal appendages destitute of accessory lamellæ

[& Meinert.

a'. Terminal segment not carinated, sides not infolded. Caudal appendages furnished with accessory lamellæ.

16. *L. californica*, Schiödte

b. Inner branch of uropoda a little longer and wider than outer branch. Terminal segment sublinguate. Abdomen deeply set in thorax

17. *L. vulgaris*, Stimpson.

b'. Inner branch of uropoda a little longer and much narrower than outer branch. Terminal segment semicircular. Abdomen less deeply inserted in thorax

[& Meinert.

18. *L. panamensis*, Schiödte

* Hist. of Crust. 1893, p. 345.

16. *Livoneca californica*, Schiödte & Meinert.

Livoneca californica, Schiödte & Meinert, Naturhistorisk Tidsskrift, xiv. 1883-84, pp. 372-374, pl. xvi. figs. 1, 2.

Hab. Shores of California, near San Francisco.

17. *Livoneca vulgaris*, Stimpson.

Livoneca vulgaris, Stimpson, Journ. Bost. Soc. Nat. Hist. xxii. 1857, p. 68, pl. xxii. fig. 9; Schiödte & Meinert, Naturhistorisk Tidsskrift, xiv. 1883-84, pp. 344-349, pl. xiv. figs. 1, 2.

Hab. Shores of California, near San Francisco, to Santa Margarita Island, Lower California.

18. *Livoneca panamensis*, Schiödte & Meinert.

Livoneca panamensis, Schiödte & Meinert, Naturhistorisk Tidsskrift, xiv. 1883-84, pp. 349-353, pl. xiii. figs. 11, 12.

Hab. Mazatlan; west shores of Central America; Panama.

10. *NEROCILA*, Leach.19. *Nerocila californica*, Schiödte & Meinert.

Nerocila californica, Schiödte & Meinert, Naturhistorisk Tidsskrift, xiii. 1881-83, pp. 72-76, pl. v. figs. 12, 13, pl. vi. figs. 1, 2.

Hab. San Diego, California; Panama Bay.

11. *ANILOCRA*, Leach.20. *Anilocra occidentalis*, sp. n.

Body two and a half times longer than broad.

Head large, broader than long, one half as broad as the first thoracic segment, produced in front in a short, blunt process, whose anterior edge is roundly truncate. Eyes large, situated at a distance equal to almost half the width of the head apart. The first pair of antennæ are composed of eight joints and extend to the middle of the first thoracic segment. The second pair of antennæ are composed of nine joints and extend to the posterior angle of the first thoracic segment; they are more slender than the first pair of antennæ.

The first thoracic segment is trisinuated on its anterior margin, and is one and a half times longer than the second thoracic segment. The other segments are subequal. The sixth and seventh segments are somewhat narrower than the fifth, and the seventh is a little narrower than the sixth.

All the epimera are long and narrow and more or less rounded posteriorly; they extend fully to the posterior angle of their corresponding segments, a character not found in any other species of the genus.

The first abdominal segment is partly covered at the sides by the last thoracic segment. The first five segments are about equal in length and width. The terminal segment is slightly wider than long, equal in length to the other abdominal segments taken together, is impressed at the base, and posteriorly rounded. The uropoda are longer than the last abdominal segment. Both branches are similar in shape and size; they are oar-like,* with truncately rounded extremities.

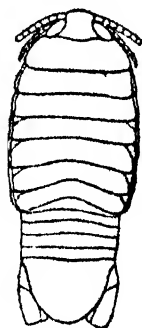


Fig. 7.

Anilocra occidentalis. $\times 4$.

The legs increase slightly in length. The basis of all the legs is carinated on the inferior margin.

Colour a light brown, marked with numerous black dots over the whole surface of the body, with the exception of the posterior half of the last abdominal segment and the inner branch of the uropoda, which are a light clear yellow without spots. The outer branch of the uropoda, which is almost black, contrasts in a marked degree with the light inner branch. In the caudal segment the change from the darker to the lighter half is graduated, making the contrast less marked.

Two individuals of this species were taken: one by the U.S. Fish Commission steamer 'Albatross,' station 3138, at a depth of 19 fathoms, and one by Dr. D. S. Jordan, both at Monterey Bay, California. One was imperfect.

Type. No. 22567, U.S. N. M. Monterey Bay. Depth 19 fathoms.

When compared with *A. laevis*, Miers*, from Peru, this species differs in the shape of the anterior portion of the head, which in *A. laevis* is narrowed and rounded, while in *A. occidentalis* it is truncate; in the greater length of the first thoracic segment and the equality in length of the succeeding segments in *A. occidentalis*, while in *A. laevis* the sixth segment is the longest, the others being of nearly equal length; in the length of the epimera, which in *A. occidentalis* attain

* Proc. Zool. Soc. London, 1877, p. 672, pl. lxxviii. fig. 6.

the posterior margin of the corresponding segments, while with *A. larvis* they are all very small and somewhat spini-form in the fifth to the seventh segments; in the greater breadth posteriorly of the terminal segment of the body in *A. larvis*, and in the shape and length of the uropoda in the two species, the two branches being of unequal length, lamellate in shape (the inner one the longer), and both shorter than the last segment of the body in *A. larvis*, while in *A. californica* they are equal in length, similar in shape, oar-like, and longer than the terminal segment.

Family VII. Sphæromidæ.

Analytical Key to the Genera of Sphæromidæ.

- a. Both exterior and interior branches of uropoda projecting
 - b. Terminal segment of the abdomen excavated at its extremity 12. *Dynamene*.
 - b'. Terminal segment of abdomen entire.
 - c. Margins of head not produced; antennæ conspicuous; legs normal; mandibles with five-jointed palp 13. *Sphæroma*.
 - c'. Anterior and lateral margins of head produced, concealing antennæ; propodus of first and second pairs of legs dilated, with reflexed dactylus, mandibles with three-jointed palp. 14. *Tecticeps*.
- a'. Only exterior branch of uropoda projecting; penultimate abdominal segment in male generally produced in spine; terminal segment excavated with median tooth 15. *Cilicæa*.

12. DYNAMENE, Leach.

Analytical Key to the Species of Dynamene.

- a. Frontal margin of head produced in a quadrangular process; first two joints of first pair of antennæ dilated 21. *D. dilatata*, sp. n.
- a'. Frontal margin of head not produced; joints of first pair of antennæ not dilated.
 - b. Abdomen tuberculated. Neither branch of uropoda reaching extremity of abdomen 22. *D. tuberculosa*, sp. n.
 - b'. Abdomen not tuberculated. Inner branch of uropoda reaching extremity of abdomen.
 - c. Ultimate segment of abdomen ridged. Branches of uropoda of equal length. Sinus at extremity of abdomen funnel-shaped 23. *D. benedicti*, sp. n.

c'. Ultimate segment of abdomen smooth.

Outer branch of uropoda but little more than half as long as inner branch. Sinus at extremity of abdomen small

D. glabra, sp. n.

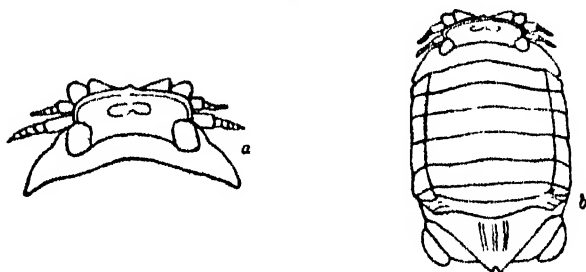
It has been suggested by several authors * that *Dynamene* may prove to be the female of *Næsa*, but until facts can be produced to substantiate this assumption, it is necessary to retain the genus *Dynamene*.

21. *Dynamene dilatata*, sp. n.

Body oval; surface very granular; colour yellow.

Head rugose, with its anterior margin produced in a quadrangular process, having a small median projection, rounded antero-lateral angles, and a thickened edge. First

Fig 8



Dynamene dilatata.

a, head and first thoracic segment, $\times 13\frac{1}{2}$; b, dorsal view, $\times 10\frac{1}{2}$.

pair of antennæ extend to the posterior margin of the head, first two joints flattened and enlarged; first joint oblong; second joint triangular, and half as long as preceding joint; third joint small, as long as second, but half as wide; flagellum six-jointed. Second pair of antennæ are but little longer than first pair and do not reach the posterior margin of the first thoracic segment.

The thoracic segments are of equal length. The epimera are square or oblong, with straight lateral margins.

The penultimate abdominal segment is short and crossed with suture-lines. The terminal segment is triangular, with a small rounded notch at the apex. There are three longi-

* Hesse, Ann. Sci. Nat. 5th ser. xvii. pp. 5, 6; Stebbing, Hist. of Crust. 1893, p. 361; Bate & Westwood, British Sessile-eyed Crust. ii. p. 432.

tudinal ridges on the segment, one in the median line and one on either side of it. The uropoda are short, not reaching the extremity of the abdomen, and regularly rounded.

The legs are slender; the first two pairs are covered with long hairs and extend in an anterior direction, the other five pairs extend in a posterior direction.

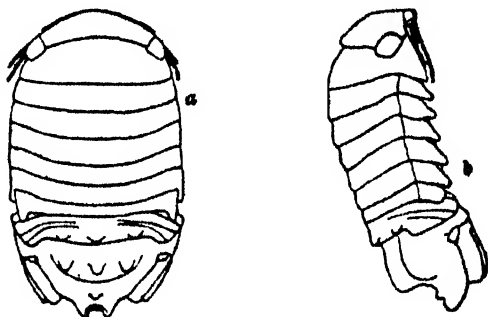
The type and only specimen was collected by Mr. Heath at Monterey Bay, California, at the surface. No. 22568, U.S. N. M.

22. *Dynamene tuberculosa*, sp. n.

Body oblong-ovate; colour light yellow, almost white; surface of abdomen tuberculated.

Head large, much broader than long, with a wide anterior margin, broadly curving on either side of a small median

Fig. 9.



Dynamene tuberculosa. $\times 8$. a, dorsal view; b, lateral view.

point. Eyes small, and situated at the extreme post-lateral angle of the head. The first pair of antennæ, composed of eight articles, reach beyond the middle of the first thoracic segment. The second pair of antennæ, composed of twelve articles, extend to the posterior angle of the first thoracic segment.

The first segment of the thorax is one and a half times longer than any of the other segments, which are about equal in length. The epimera, which are distinctly marked, and roundly produced at their posterior angles, are much broader than long.

The first abdominal segment is transversely crossed by three suture-lines, indicated at the sides of the segment. Three small tubercles are situated in a transverse line on the posterior

margin of this segment. The terminal segment is subtriangular in shape, with a broad funnel-like excavation at its extremity, formed by the infolding of the lateral edges. The anterior part of the terminal segment is very convex, upon which elevation are situated three large tubercles in a transverse row, the centre one being in the median line. At the base of the terminal excavation is also a small tubercle. Both branches of the uropoda are similarly shaped, being of the same width throughout their entire length and rounded posteriorly. The outer branch is somewhat shorter than the inner branch; neither reaches the extremity of the abdomen.

Individuals were found at Gualala, California, on *Haliotis rufescens*, by Dr. R. E. C. Stearna; also one specimen at Catalina Harbour, California, and one at Popoff Island, Aleutian Islands, at low water, by Mr. W. H. Dall.

Type. No. 22569, U.S. N. M. Popoff Island, Aleutian Islands.

23. *Dynamene benedicti*, sp. n.

Body oblong, oval; surface minutely granular; colour dark grey.

Head with small median point. Eyes situated post-laterally. First pair of antennæ extend to the middle of the first thoracic segment; first joint of peduncle longest; second and third joints about equal in length; flagellum contains six joints. Second pair of antennæ extend to the posterior margin of the second thoracic segment; flagellum contains about eleven joints.

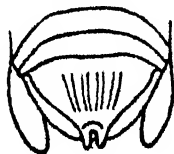
The thoracic segments are of equal length. The epimera are square, with rounded posterior angles.

The penultimate abdominal segment is crossed by suture-lines indicative of coalesced segments.

The terminal segment is triangular, terminating posteriorly in two teeth separated by a narrow, rounded, funnel-shaped sinus. This segment is very convex, and bears two longitudinal ridges on either side of the median line. The uropoda do not exceed in length the extremity of the terminal segment. Both branches are rounded posteriorly and are similar in shape and size.

The type was collected by Mr. Heath at Monterey Bay, California, at the surface. No. 22570, U.S. N. M.

Fig. 10.



Dynamene benedicti. $\times 13\frac{1}{2}$.
Last thoracic segment and abdomen.

24. *Dynamene glabra*, sp. n.

Body oval; surface smooth.

Head small; eyes situated post-laterally. First pair of antennæ extend to the eye; first joint oblong; second joint short, half as long as first; flagellum contains six articles. Second pair of antennæ extend to the posterior margin of the first thoracic segment; flagellum contains about ten articles.

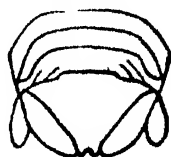
Thoracic segments are subequal; the first is a little longer than any of the others.

The penultimate abdominal segment consists of several coalesced segments, as indicated by the suture-lines. The terminal segment is triangular, with a small median excavation at its extremity. The lower part of this segment is quite flat, the slope being gradual from the convex upper part or base of segment to the extremity. The inner branch of the uropoda is large and rounded posteriorly; the outer branch is small, though similar in shape, and is much shorter than the inner branch.

A number of specimens were collected by Mr. Heath at Monterey Bay, California, at the surface.

Type. No. 22571, U.S. N. M.

Fig. 11.



Dynamene glabra. $\times 134$.
Abdomen and last two
thoracic segments.

13. SPHÆROMA, Latreille.

Analytical Key to the Species of Sphæroma.

- | | |
|---|--------------------------------------|
| a. Body widening gradually from head backwards. Thorax transversely ridged and provided with three longitudinal rows of small tubercles. Branches of the uropoda very large, expanded | 25. <i>S. amplicauda</i> , Stimpson. |
| a'. Body not increasing in width. Surface of thorax smooth. Branches of the uropoda not expanded. | |
| b. Extremity of abdomen produced in a rhomboid process | 26. <i>S. rhomburum</i> , sp. n. |
| b'. Extremity of abdomen not produced. | |
| c. Surface of abdomen tubercular | 27. <i>S. octoncum</i> , sp. n. |
| c'. Surface of abdomen smooth | 28. <i>S. oregonensis</i> , Dana. |

25. *Sphæroma amplicauda*, Stimpson.

Sphæroma amplicauda, Stimpson, Proc. Bost. Soc. Nat. Hist. vi. 1857, p. 89.

Hab. Tomales Bay, California.

Stebbing * suggests that a new genus near *Cycloidura* may be required for this species.

26. *Sphæroma rhomburum*, sp. n.

Surface of body punctate; colour whitish yellow.

Head small. First pair of antennæ reach almost to the posterior margin of the first thoracic segment. Second pair of antennæ extend quite to the posterior margin of the first thoracic segment. Eyes situated post-laterally.

Thoracic segments equal in length. Epimera broad and short, extending downwards,

Sphæroma rhomburum > 13½
Abdomen.

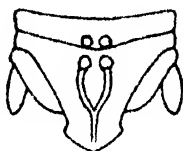


Fig 12.

forming an angle with the segments. First abdominal segment as long as any of the thoracic segments, crossed by suture-lines and surmounted by two tubercles, close together, one on either side of the median line. Terminal segment with its extremity produced in a process rhomboid in shape and with sides infolded, forming a kind of funnel-like opening when seen from beneath. At the base of this segment are two tubercles, which are continuous with two longitudinal ridges in the centre of the segment. These ridges unite near the extremity and continue as one median ridge. The uropoda are shorter than the terminal segment; the outer branch is more lanceolate in shape; both are of equal length.

Two specimens were taken at Monterey Bay, California, by Mr. Heath.

Type. No. 22573, U.S. N. M.

This species is near *S. egregium*, Chilton †, from Arakoa, but differs in the presence of two tubercles on the first abdominal segment, in the presence of two tubercles and two longitudinal ridges uniting in a single ridge on the terminal segment, and in the equality in length of the two branches of the uropoda.

* Hist. Crust. 1893, p. 304.

† Trans. New Zealand Inst. xxiv. 1891, p. 200.

27. *Sphæroma octoncum*, sp. n.

Body with all the thoracic segments, except the first, marked with four conspicuous brown spots, two on either side of the median line, and with two spots on the first abdominal segment, one on either side of the median line.

Head small. First pair of antennæ reach almost to the posterior margin of the first thoracic segment. Second pair extend fully to the posterior margin of the first segment.

Thoracic segments subequal. Epimera broad and extending downward, forming an angle with the segments.

First abdominal segment with two low tubercles close together, situated one on either side of the median line; terminal segment triangular, with apex narrowly rounded and sides slightly infolded, forming a small opening when seen from below. Six low tubercles are situated on this segment, two in longitudinal series on either side of the median line—the lower ones being a little farther apart than the upper ones—and one on either side of the series. The uropoda do not reach the extremity of the abdomen by some little distance. The outer branch is the shorter and is broadly rounded posteriorly. The inner branch is more pointed at the extremity.

Five individuals of this species were sent by Mr. Heath from Monterey Bay, California.

Type. No. 22574, U.S. N. M.

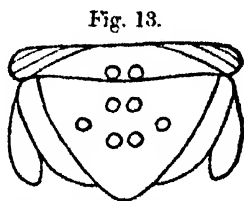


Fig. 13.

Sphæroma octoncum. $\times 13\frac{1}{2}$.
Abdomen.

28. *Sphæroma oregonensis*, Dana.

Sphæroma oregonensis, Dana, Proc. Acad. Nat. Sci. Philad. vii. p. 177; U.S. Expl. Exp., Crust. ii. p. 778, pl. lii. fig. 4; Stimpson, Journ. Bost. Soc. Nat. Hist. vi. 1857, p. 60.

Sphæroma olivacea, Lockington, Proc. Cal. Acad. Sci. vii. 1877, pt. i. p. 45.

Hab. Pacific Grove to Alaska.

14. TECTICEPS, Richardson.

Analytical Key to the Species of Tecticeps.

- a Terminal segment of abdomen pointed.
Outer branch of uropoda much longer than inner branch. First pair of antennæ reach the posterior angle of the first thoracic segment. Second

pair reach the middle of the second thoracic segment. Sixth and seventh pair of legs show a marked disproportion in the length of the propodus.

- Terminal segment of abdomen widely rounded. Outer branch of the uropoda not longer than inner branch. First pair of antennæ reach the posterior angle of the third thoracic segment. Second pair of antennæ reach the middle of the fourth thoracic segment. Sixth and seventh pairs of legs show only a gradual increase in size

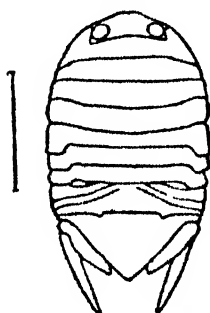
29. *T. alascensis*, Richardson.

30. *T. convexus*, sp. n.

29. *Tecticeps alascensis*, Richardson.

Tecticeps alascensis, Richardson, Proc. Biol. Soc. Washington, xi. 1897, pp. 181-183.

Fig. 14.



Tecticeps alascensis, Richardson. $\times 2\frac{1}{2}$.

Hab. Alaska; Kamchatka.

30. *Tecticeps convexus*, sp. n.

Body oval, somewhat flattened. Surface smooth; colour light yellow with markings of brown.

Head with the anterior margin much broader than the posterior margin, produced in front, but not wholly concealing the basal joints of the first pair of antennæ, and somewhat raised, forming two small convex elevations. The anterolateral margin is likewise produced, forming an acute angular projection, which extends in a lateral direction beyond the post-lateral margin of the head. The eyes are dorsally situated in a median transverse line. The first pair of antennæ, with a flagellum of sixteen articles, extend to the posterior angle of the third thoracic segment. The second

pair of antennæ, with a flagellum of thirteen articles, extend to the middle of the fourth thoracic segment, and exceed by

Fig. 15.

*Tecticeps converius*

a, head, $\times 5\frac{1}{2}$, b, abdomen and last thoracic segment, $\times 2\frac{1}{2}$

one joint the length of the first pair of antennæ. Both pairs of antennæ are disposed to lie concealed under the broad epimeral plates of the thoracic segments.

The thoracic segments are subequal in length. The first segment has its antero-lateral angles produced around the anterior portion of the head, forming a broad plate at the side of the segment. The epimera are almost twice as broad as long; those of the fifth segment extend downward, with the anterior margin straight, making the length and breadth about equal, and forming almost square epimera; in the epimera of the sixth and seventh segments the anterior margins are in the same direction as the posterior margins, which extend downward.

The first segment of the abdomen has three suture-lines, and its posterior margin is produced in two small points, one on either side of the median line, about equidistant from it and the lateral margin of the segment. The terminal segment is widely rounded posteriorly. The inner branch of the uropoda is of nearly equal width throughout its length and is rounded at its extremity; the outer branch is slender and sharply pointed. Both branches are of nearly equal length and neither extends beyond the tip of the abdomen.

The first pair of legs have the propodus dilated and the dactylus reflexible. The propodus is large and oval in shape. In the legs of the second pair the propodus is irregular in shape, sometimes dilated with reflexible dactylus, and sometimes simple. The legs of the other five pairs are similar in structure, ambulatory, and show a gradual increase in length.

A number of individuals were found at Monterey Bay, California, and sent to the U.S. National Museum by Mr. Heath, who gives the following notes of their habits:—

“They were taken by the Chinese fishermen from a sandy sea-bottom about 30 feet below the surface (according to the Chinese statement). These are rapid swimmers, and the

moment they are disturbed they roll into a ball and project the exopodite of the last free segment. This is undoubtedly for protection. I have not had time to accurately examine the position nor character of this appendage, but its sharp sword-like nature is readily recognized."

Type. No. 22572, U.S. N. M.

This species differs from *T. alascensis* in having longer antennæ and antennulæ; in having a rounded terminal segment, which in that species is very pointed; in having the outer branch of the uropods as short as the inner, which in that species is much longer; in having only a gradual increase in the length of the legs, which in that species show such marked disproportions in the propodus of the sixth and seventh pairs; and in the position of the eyes, which in this species are situated in the median transverse line of the head, while in *T. alascensis* they are placed in the posterior half of the head.

15. CILICÆA, Leach.

Analytical Key to the Species of Cilicæa.

a. Surface of body smooth.

b. Terminal segment with three sinuses, one above another, the two upper openings heart-shaped. Terminal segment as broad as long. Outer branch of the uropoda armed with four spines, broad and flat at upper end, and tapering to extremity, which does not reach beyond the tip of the abdomen

31. *C. cordata*, sp. n.

b'. Terminal segment with a large sinus, in which are placed six sharp teeth. Terminal segment nearly twice as broad as long. Outer branch of the uropoda smooth, slender, cylindrical, and reaching much beyond the tip of the abdomen . .

[subsp. n.]

32. *C. cordata gilliana*,

a'. Surface of body densely granulated. Terminal segment with a quadrangular excavation, in the centre of which is a long tooth

33. *C. granulosa*, sp. n.

The position of the three following species is somewhat doubtful, since they lack the spine on the penultimate abdominal segment, which is characteristic of the genus *Cilicæa*. It has been noted by Stebbing *, by Miers †, and by Haswell ‡ that with many species of *Cilicæa*, as well as with some of the other genera of the Sphæromidæ, the spine is present and developed in the males but wanting in the females. As our

* Hist. Crust. 1893, p. 364.

† Zool. Coll. 'Alert,' 1884, p. 308.

‡ Proc. Linn. Soc. New South Wales, vi. p. 188.

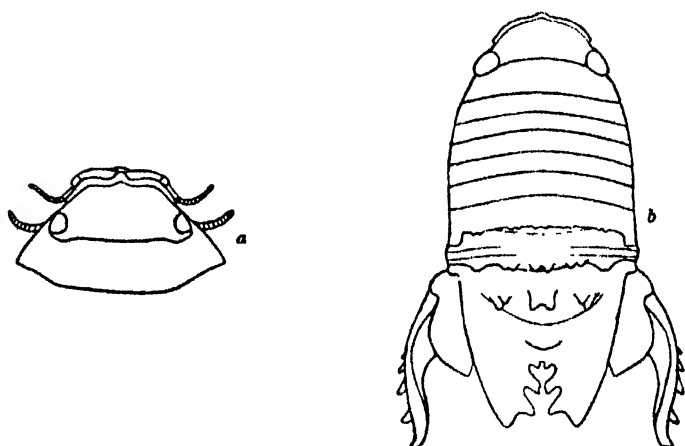
three new species agree with the generic characters of *Cilicæa* except in the presence of the spine, we consider them for the present new and undescribed species of *Cilicæa*.

31. *Cilicæa cordata*, sp. n.

Body attenuated in front; colour a faint yellow, profusely marked with a delicate pink tint.

Head with the anterior margin thickened, and slightly produced in front. Prominent median point triangularly

Fig. 10.



Cilicæa cordata. $\times 8$.
a, head and first thoracic segment; b, dorsal view.

shaped. Frontal margin broadly lobed on either side of median point. Eye situated at post-lateral angle of head. First pair of antennæ reach beyond the posterior margin of head; first joint of peduncle oblong; second joint very short; flagellum contains about nine articles. The second pair of antennæ extend to the posterior angle of the third thoracic segment; the flagellum contains about fifteen articles.

The thoracic segments are about equal in length, with the exception of the first, which is a little longer than any of the others. The epimera are very broad and drawn out to an apex, which is rounded. They are scarcely visible in a dorsal view, as they project downward laterally, forming an angle with the segments. The last thoracic segment is furnished with low tubercles on its posterior margin.

On the first abdominal segment are five double tubercles.

The terminal segment of the body has three sinuses, one above another, the two upper openings being heart-shaped. Six teeth are grouped in a series of two each, and are placed in such regularity as to give the appearance of a triple sinus. At the base of the upper sinus is a large rounded tubercle, peaked at the top. Three double tubercles are also situated at the base of the abdomen. The inner branch of the uropoda is fixed and immovable; it is broad and pointed at its extremity and extends two thirds the length of the terminal segment. The outer branch is long and slender, broad and flattened above, more rounded and tapering at the extremity, somewhat incurved, and extends a little beyond the end of the abdomen. Its outer edge is crenulate and its under surface armed with four spines.

The legs are long and slender, all ambulatory, and with dactylus biunguiculate.

Two specimens were collected at Popoff Island (Aleutian Islands) by Mr. W. H. Dall at low water.

Type. No. 22575, U.S. N. M., Popoff Island.

Another individual was found at Catalina Island, California, by Dr. J. G. Cooper. In this specimen the sixth thoracic segment is also tuberculated. One specimen was found by Mr. Heath at Monterey Bay on the pink coralline at low tide, and is shaded with a delicate pink. In this specimen, on the seventh thoracic segment and the penultimate abdominal segment, the tubercles on either side of the median line of tubercles are single instead of double.

32. *Cilicæa caudata gilliana*, subsp. n.

Body slightly attenuated in front. Colour light brown with markings of black.

Head with anterior margin thickened and slightly produced. Large median point triangularly shaped, on either side of which the frontal margin of the head is broadly lobed. Eye situated at the posterior angle of the head. First pair of antennæ reach beyond the posterior margin of the head; first joint of peduncle is oblong; second joint very small; flagellum contains eight joints. The second pair of antennæ are broken in the specimens examined.

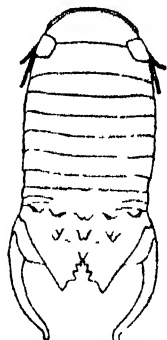
The thoracic segments are about equal in length, with short but very broad epimera, which extend downward laterally, forming an angle with the segments. The last segment is ridged with very low tubercles on its posterior margin.

The first abdominal segment has two suture-lines, indicative of coalesced segments, and bears five double tubercles.

The terminal segment has a large sinus in which are situated six sharp teeth. At the base of the sinus is a large tubercle. Three double tubercles are also found at the base of the terminal segment. The inner branch of the uropoda is affixed to the sides of the abdomen and extends two thirds of its length; it is triangularly pointed at its extremity. The outer branch is long and slender, almost cylindrical in shape, smooth, somewhat incurved, and extends much beyond the tip of the terminal segment.

The legs, all ambulatory, are slender, with dactylus uniungiculate.

Fig. 17.



Specimens were dredged off *Cilicea caudata gilliana*. $\times 8$ Catalina Island, California.

Type. No. 22576, U.S. N. M.

These specimens differ from *Cilicea caudata* (Say)* in the presence of six distinct teeth within the sinus of the terminal segment, while in that species there are but four; in the greater development of the spine at the base of the sinus; and in the median double tubercle at the base of the terminal segment.

33. *Cilicea granulosa*, sp. n.

Surface of body densely granulated; granules large and close together.

Head with anterior margin thickened, and produced in a small median point, on either side of which the margin is lobed. Eyes situated post-laterally. First pair of antennæ extend to the posterior margin of the first thoracic segment; first joint of peduncle oblong; second joint short. Second pair of antennæ extend to the posterior margin of the third thoracic segment.

The first thoracic segment is longer than any of the following segments. The epimera are twice as broad as long.

The first abdominal segment is short and bears indications

* *Cilicea caudata* (Say).

Næsa caudata, Say, Journ. Phil. Acad. i. p. 482; Milne-Edwards, Hist. Nat. des Crustacés, iii. p. 219.

Cymodocea caudata, Ives, Proc. Acad. Nat. Sci. Philad. 1891, p. 188, pl. vi. figs. 11-14.

of three coalesced segments. There are three transverse elevations on this segment, which are densely covered with granules. The terminal segment bears three transverse elevations at the base, the median one terminating in a spine. On its posterior margin is a quadrangular excavation, with a long median tooth, bearing a spine at its extremity. At the base of the tooth is a small elevation. On either side of the terminal excavation, a short distance up the lateral margin, is a small spine. The fixed inner branch of the uropoda is small and short; the outer branch is long, blunt at the extremity, somewhat incurved, and reaches, when open, much beyond the terminal segment. The margins of the terminal segment and the edges of the outer branch of the uropoda are pubescent.

The legs are all simple, ambulatory.

One specimen from Cerros Island, Lower California, was collected by Mr. A. W. Anthony, at a depth of 20 fathoms. Type. No. 22649, U.S. N. M.

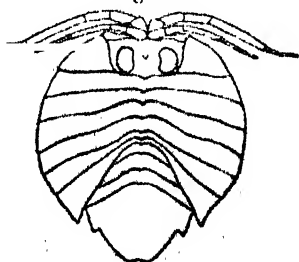
Family VIII. Serolidæ.

16. SEROLIS, Leach.

34. *Serolis carinata*, Lockington.

Serolis carinata, Lockington, Proc. Cal. Acad. Sci. vii. 1877, pt. i. p. 36.

Fig. 19.

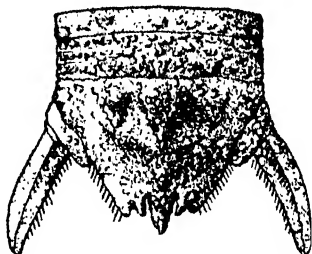


Serolis carinata, Lockington. $\times 8$.

Hab. San Diego, California.

[To be continued.]

Fig. 18.



Cilicea granulosa. $\times 8$. Last thoracic segment and abdomen.

XV.—*Observations on some Species of Coccidæ of the Genus Ceroplastes in the Collection of the British Museum.* By E. ERNEST GREEN, F.E.S.

[Plate IV.]

IN the collection of the British Museum at South Kensington are specimens of a large *Ceroplastes* recently received from Cape Colony. Other examples were subsequently received from Egypt, through the Royal Gardens, Kew. In size and external appearance these insects may be readily mistaken for *Ceroplastes ceriferus*, Anders. There is the same coating of dense whitish wax of irregular form, and the individuals are similarly massed upon the twigs of the plants. But after removal of the waxy coat the form of the insect itself is found to differ completely from that of *ceriferus*. The accompanying figures will best show the distinguishing characters. In *C. ceriferus* (Pl. IV. figs. 3, 3a) the anal aperture is at the extremity of a long chitinous horn-like extension of the abdomen, while in the species from the Cape this part is mounted on a short chitinous tubercle (figs. 1, 1a, 1b).

The species, which appears to be new, is here described under the name of

Ceroplastes africanus, sp. n. (Pl. IV. figs. 1–1f.)

Insects crowded on the stems of the plant (fig. 1), so much so that the waxy covering of adjacent individuals becomes more or less confluent and the normal form of the test is difficult to determine. The tests appear as rounded masses of cream-coloured wax, each with a more or less distinct nipple-like prominence at the apex bearing a small spot of whiter substance.

The usual opaque white bands from the spiracular regions are present, but very inconspicuous, scarcely extending beyond the margin. In some specimens a series of impressed arches on the sides of the test marks the position of the marginal plates. The waxy coating being thinner on the impressed parts, the arches appear darker, the colour of the body of the insect showing through the covering-matter. An isolated test averages 7·75 millim. long, 6·50 millim. broad, 5·75 millim. high.

Female, denuded of wax (figs. 1, 1a, 1b), reddish brown to dark brown, the whole surface strongly chitinated; irregularly globose; apex often with an oblong scar corresponding

with the position of the early larval pellicle, but which becomes almost obliterated in the oldest examples. In the early adult the median is separated from the marginal area by a more or less distinct furrow, which is particularly marked where it meets the anal tubercle (fig. 1 a). In the older examples only this hinder part of the furrow remains (fig. 1 c). Cephalic area constricted off from the globose body, forming a trowel-shaped projection in front. Spiracular clefts deeply indented, thickly set with small conical spines, not constricted at the base (fig. 1 d). Marginal hairs very small, few and inconspicuous. Anal scales minute, inner edge straight, base and outer edge together forming a semicircle. Anal tubercle blackish, directed upwards. Derm with numerous glandular pores, which are more distinct on the darker marginal area. Antennæ with either 7 or 8 joints. It is difficult to say which is the normal number, as the two varieties are about equally represented in the series under examination. With the 8-jointed form (fig. 1 e) the formula runs:—3, (1, 2), 8, 4, 5, (6, 7). When there are seven joints only (fig. 1 f) the formula is 3, (1, 2, 4), 7, (5, 6). In this latter case there is a tendency for the fourth joint to separate into two, and there is always a more or less distinct false joint in the terminal segment. Legs well developed; tarsus more than half length of tibia. Foot with 4 digitules, the unguals broadly spatulate, the tarsals fine knobbed hairs.

Length of fully developed female 5.50 millim., breadth 5.0 millim., height 4.25 millim.

The male insect is unknown in any stage.

Hab. On *Acacia*, sp., Kleinpoort, Eastern Karoo, Cape Colony. Collected by Miss Anna Howarth.

The comparatively large number of joints in the antennæ of this species is remarkable. Even the number 7 is abnormal in the genus *Ceroplastes*, nearly all the known species having 6-jointed antennæ. I believe the only exception (besides the present insect) is that of *C. nerii*, described by Mr. Newstead, from Algeria. This character might have been considered a peculiarity of the African members of the genus had not Mr. Newstead also described a *Ceroplastes personatus* with 6-jointed antennæ, from Lagos, West Africa.

The wax, which in fresh examples is soft and easily soluble in benzole, in dried specimens becomes very hard and dense, and seems scarcely, if at all, affected by benzole. If it could be collected in sufficient quantities, the wax might prove of economic value. The waxy matter of the Indian species (*C. ceriferus*) is said to have been tested and found to contain too much water for use as an illuminant; but this fault could probably be remedied by proper preparation.

Examples from Egypt, also occurring on a species of *Acacia*, agree with those from the Cape in general appearance and structure, including the characters of the anal tubercle and stigmatic clefts. They are not in sufficiently good condition to allow of a critical examination of the antennæ.

Ceroplastes africanus, var. *cristatus*, nov.
(Pl. IV. fig. 2.)

There are in the collection examples from Natal, labelled "Giam Insect Wax," differing from the type only in the presence of a small dorsal crest corresponding to the position of the central scar described above. These examples are larger than either the Egyptian specimens or those from the Cape, and may be distinguished by the varietal name *cristatus*. The waxy test has a diameter of 12 millim. The denuded female measures 6 millim. long, 5.25 millim. broad, and 4.25 millim. high.

Ceroplastes ceriferus, Anderson.
(Pl. IV. figs. 3-3 b.)

The original description of *ceriferus* by Anderson deals with the external characters of the insect only. Maskell points out (Trans. N. Z. Instit. 1893, p. 216, pl. xii. figs. 13, 16) that the anal scales in this species are situate on a horn-like process. I have noticed this peculiar character in typical examples from India and Ceylon (see figs. 3, 3 a of the accompanying Plate). Maskell goes on to remark that this feature, together with the structure of the spiracular spines, which he figures as sharply constricted at the base, leads him to the conclusion that *C. Fairmairii* of Targioni is identical with *ceriferus* of Anderson, the latter name having precedence. Signoret figures *Fairmairii* on plate 7 (ix.), fig. 7, of his 'Essai,' and shows the conical spiracular spines as mounted on short pedicels, a character which is said to occur also in *Vinsonii*, Sign. But in *ceriferus* I am convinced that the spines are properly sessile and that the appearance of a pedicel is unreal, being produced by the subcutaneous tube leading inwards from the spine (*vide* fig. 3 b). These tubes accompany the stigmatic spines in all the species, but are more prominent in some than in others; their distinctness is also affected both by the age of the individual under examination and by the method of preparation.

Until typical examples of *Fairmairii* have been critically examined the two species should be retained.

Ceroplastes floridensis, Comstock.

Comstock, in his Annual Report for 1880, p. 331, mentions that his species *C. floridensis* carries similar arrow-shaped tubercles (or stigmatic spines). I have examined the common Ceylonese species, which (on the authority of Dr. L. O. Howard) I have placed under *C. floridensis*, and find that the arrow-shaped appearance of the spines is here also deceptive, and that they are really sessile with a subcutaneous connecting-tube.

Ceroplastes australiæ, Walk. (Pl. IV. fig. 4.)

Ceroplastes australiæ, Walk. List of Homopt. in Brit. Mus. iv. (1852) p. 1087.

Specimens in the Museum collection, labelled "*australiæ*, Walk.," when denuded of their waxy covering exhibit the long anal process and all the other characters of *C. ceriferus*. The waxy test is thick and irregular in form. These examples are very small (the tests only 3.50 millim. long, and the denuded insect 2.25 millim.), but they are immature, and I have little hesitation in asserting that they are young examples of *ceriferus*. The anal tubercle is very prominent (see fig. 4), standing up like the spout of a tea-pot.

Other unnamed examples from the B. M., labelled only "Sydney," are similarly immature examples of *ceriferus*.

Ceroplastes chilensis, Gray.

Some specimens labelled *chilensis*, Gray, also appear to me to be immature examples of *ceriferus*. I am informed by Mr. C. O. Waterhouse that these are the type specimens described by J. E. Gray in 'Spicilegia Zoologica.' Signoret, in his 'Essai' (pl. vii. fig. 5), gives a figure of *chilensis* in which the test is represented with a series of well-defined marginal plates. The examples under examination have an irregular homogeneous waxy test, as in typical *ceriferus*. The denuded insect shows the long horn-like anal tubercle. The body is deeply cleft in front, but this is merely an accident due to its position on a very thin twig, causing the lateral margins of the body to grow round and embrace the support.

With regard to the locality, Mr. Waterhouse writes me as follows:—"Gray, at the end of his description, says the specimens were found by Mrs. Graham during her residence in the Brazils and Chili [he refers to *chilensis* and *janaiensis*]. The locality is probably correct, but I can find no mention of

either in this lady's book. I note, however, that she had been in India and Ceylon." It seems just possible, therefore, that these specimens may have been really collected in India and wrongly ascribed to South America.

EXPLANATION OF PLATE IV.

Fig. 1. Waxy tests of *C. africanus* from Cape Colony *in situ* on twig of *Acacia* (nat. size).

Fig. 1 a. Female insect denuded of wax. Dorsal view (enlarged).

Fig. 1 b. Ditto. Side view (enlarged).

Fig. 1 c. Ditto. Older example.

Fig. 1 d. Ditto. Stigmatic cleft and spines.

Fig. 1 e. Ditto. Antenna with eight joints.

Fig. 1 f. Ditto. Antenna with seven joints.

Fig. 2 *C. africanus*, var. *cristatus*, from Natal, denuded of wax.

Fig. 3. *C. ceriferus*, from Ceylon, denuded of wax. Dorsal view.

Fig. 3 a. Ditto. Side view.

Fig. 3 b. Ditto. Stigmatic spines.

Fig. 4. *C. australis* (= *C. ceriferus*, juv.).

20th July, 1890.

XVI.—*Further Contribution towards a Check-list of the non-Marine Molluscan Fauna of South Africa, with Descriptions of Fourteen new Species.* By JAMES COSMO MELVILL, M.A., F.L.S., and JOHN HENRY PONSONBY.

[Plate III.]

IN December 1898 we published a first "contribution" *, which was shortly afterwards followed by Dr. Sturany's 'Catalog' †, thanks to which excellent work and to information from other sources we are enabled to make various additions to our original list. We have also received fresh material from several friends in South Africa, with the result that fourteen new species (many of them, as will be seen, of peculiar interest) are described in this paper.

Addenda et Corrigenda.

(The pages quoted are those of our above-mentioned Check-list.)

N.B.—The asterisk denotes that we have not seen those shells to the names of which it is prefixed.

Page 171. Add *Helicarion leucospira*, Pfr. (*Vitrina*) Proc. Zool. Soc. 1856, p. 326; Rve. Conch. Icon. fig. 21.—*Hab.* Natal (cf. Cox, Mon. Austr. pl. xiv. fig. 6).

* Proc. Mal. Soc. vol. iii. p. 160.

† 'Catalog Südafrik. Land- und Süsswasser Moll.' (Wien, 1898).

We have lately received from Mr. Burnup undoubted specimens of this species from Pinetown and Maritzburg. Is it possible that this may prove to be identical with *Helicolimax pellucida*, Fér.?

Page 172. Add **Urocyclus Kurku*, Gray, Proc. Zool. Soc. 1864, p. 251.—*Hab.* Natal.

Page 174. *Trachycystus rivularis*, Krs. — *Hab.* Natal (not Cape Town).

Page 176. Add **Bul. utellinus*, Pfr. Proc. Zool. Soc. 1854, p. 57.—*Hab.* Natal.

Page 178. Add **Achat. Schencki*, Mts. Sitz. B.r. Ges. naturf. Berlin, 1860, p. 164 — *Hab.* Transvaal.

Page 180. Add **Onchidium Peroni*, Cuvier, Ann. Mus. Nat. Hist. vol. v (1804) p. 38, pl. vi.—*Hab.* Natal.

Page 180. **Auricula pellucens*, Mke., is mentioned by Krauss (Sudafr. Moll. p. 82) as coming from Natal. Is it possible that this species may have been quoted in error? Could Krauss have had before him specimens of the shell hereinafter described as *A. durbanica*?

Page 181. **Limnaea umlaasiana*, Kust. Dr. Sturany, in quoting this species, observes that Bourguignat considered it identical with *L. truncatula*, Drap., recorded by us on page 184. We have not seen Kuster's species, but should be quite disposed under the circumstances to accept Bourguignat's verdict.

Page 181. Dr. Sturany states that on anatomical grounds some of the species included by us in the genus *Physa* should be removed to *Isidora*. It appears that *P. zanzibarica*, Cless., has priority over *P. cornea*, Morel.; *P. Forskali*, Ehrn., has priority over *P. Wahlbergi*, Krs., a species of *Pyrgophysa*, to which perhaps *P. gradata*, M. & P., should be added. *Physa Craveni*, Ancey, must be substituted for *P. lirata*, Craven (nom. præocc.). Dr. Sturany calls this species "*P. Craveni*, mihi," overlooking the fact that Ancey gave it this name in 'Le Naturaliste' of 1886.

Page 182. Add **Paludestrina caledonensis*, Chaper, as *Hydrobia*, Bull. Soc. Zool. de France, vol. x. (1885) p. 484, pl. xi. fig. 6.—*Hab.* Cape Colony.

Add **Paludestrina zwellendamensis*, Kr., Kust. Conch.-Cab. (*Paludina*) p. 53, pl. x. figs. 19, 20.—*Hab.* Cape Colony.

Melania histrionica, Rve. Conch. Icon. xii. pl. xxix. sp. 192, was described from "Cape Colony" on the authority of the Cummingian collection. The type, now in the British Museum, appears to be closely allied to, if not a variety of, *Paramelania aurita*, Mull., a West-African species, whose presence in South Africa appears to require confirmation.

Cleopatra amæna, Morel., would seem from the type in the Brit. Mus. to be scarcely a var. of *C. ferruginea*, Lea. We have lately received some young shells, collected by Dr. Gibbons at Prieska, which may be referable to this species.

Cyclotus natalensis, Pfr., has been shown by Ancey (Bull. Mus. Marseilles, vol. i. (1898) p. 136) to be the *Cyolophorus Klobukowsku*, Morlet, from Tonkin, and must therefore be removed from South-African lists.

Ancey has further proposed (*loc. cit.*) the name *Chondrocyclus* for *Cycloph. convexiusculus*, Pfr., and to this section *C. alabastris*, Craven, should no doubt be assigned. An examination of the operculum of *C. minimus*, M. & P. (now for the first time figured, Pl. III. fig. 15), shows it to possess a multispiral horny series of whorls with a small central nucleus, the whorls being slightly elevated and concave.

The term *Austrocyclus*, proposed by Ancey (*loc. cit.*) to receive *Cycloph. Wahlbergi*, can only be regarded as a synonym of *Hijabia*, Godw.-Aust., published in Jan. 1898, while Ancey's paper is dated June of the same year.

Page 183. **Neritina crepidularia*, Lam. Hist. Nat. Anim. s. Vert. vi. 2, ed. 2, viii. p. 572.-*Hab.* Natal.

This species has been found in Ashanti, but we have not met with it at present from South Africa.

**Neritina Knorri*, Recluz, Rev. Zool. (1841) p. 474, non Reeve, Conch. Icon pl. ii. sp. 6, = *N. Beckii*, Recluz.

Probably a form of *N. pulligera*, L., ? found in South Africa.

Trachycystis charybdis, Bens.—Thanks to the kindness of the Rev. A. H. Cooke, we have been able to inspect the type of Benson's hitherto unfigured "*Helix*" *charybdis* in the Cambridge Museum. It is, unfortunately, a good deal damaged, so we have thought it best to give a figure of a specimen † from our collection, which appears to correspond in every way with the type, except that the latter is a trifle smaller. Our specimen came from the neighbourhood of Cape Town.

Ennea microthauma †, sp. n. (Pl. III. fig. 1.)

E. testa minuta, subperforata, crystallina, pellucida, nitida, delioliiformi, apice obtusissimo; anfractibus $5\frac{1}{2}$, ventricosi, apud suturas impressis, undique delicate et obscure longitudinaliter arcuati-striatis, tribus ultimis rectis; apertura anguste ovata; peristomate continuo, auriformi, dentibus plicisve quatuor munito, videlicet, plica parietali magna, acinaciformi, intrante, dente labiali duplicato, partim interno, mamillato, basali parvo, acuto; margine columellari incrassato, columella intus valde plicata, plica perintrante, et aperturam semiclaudente.

Long. 2, lat. 1 mm.

Hab. Grahamstown (*Langley*).

A minute glassy species, of which we have seen four examples. Its mouth-processes consist of a large, deep-seated, sharp parietal plait, a double labial tooth, the lower projection of which is mamillate and internal, a small acute basal tooth, and below the thickened columellar margin a very deep-seated extensive plait, half closing the aperture. We should consider *E. Farquhari*, M. & P., a near ally of this species, equally minute, similarly subpellucid, and delicately longitudinally striate, and also furnished with four mouth-processes, of which the parietal and labial plaits and teeth are not very dissimilar, the labial tooth being bifid in both species; the columellar margin is, however, much more pronounced in *E. microthauma*, almost as much so as in *E. labyrinthica*, M. & P.

† Pl. III. figs 16, 16 a, 16 b.

1 μικρός, θαύμα, a little wonder.

Ennea jurtidens, sp. n. (Pl. III. fig. 2.)

E. testa cylindrica, subperforata, nitente, apice obtusissimo; anfractibus 7-8, præcipue rectis, lævibus, interdum sub lente juxta suturas obscure et evanide obliquistriatulis; apertura ovata; peristomate albo, crassiusculo, dentibus plicisve quatuor munito, dente parietali brevi, recto, labiali acuto, prominulo, basali minuto; plica columellari interna, inconspicua.

Long. 4.50, lat. 2 mm.

Hab. Van Rienen, Drakensberg Mountains (*Mrs. Quickett*).

This shining, smooth, subpollucid species has for its near allies both *E. cionis* and *vanstaadensis*, M. & P. From the former it differs in being larger, in possessing less ventricose whorls, in the simple labial tooth, and the inconspicuous columellar plait. From the latter in the almost smooth and glossy surface, in being smaller, and likewise not possessing a bifid labial tooth; the columellar plait, too, of *E. vanstaadensis* is far more deep-seated and large.

Many examples.

Zingis Haygarthi, sp. n. (Pl. III. fig. 3.)

Z. testa crystallina, tenuissima, obscure perforata, superne depresso-conica; anfractibus quatuor, undique spiraliter sub lente delicatissime striatis, supra, juxta suturas, castaneo-unizonatis, anfractu ultimo magno, supra medium acuticarinato, infra rotundato; apertura circulari-lunata, intus pellucida, spiraliter unizonata; peristomate tenui, margine columellari circa umbilicum minutum reflexo.

Alt. 6.50, diam. 8 mm.

Hab. 'Nkandhla Forest, Zululand (*Haygarth*).

An unusually beautiful and delicate species, our examples being perhaps not quite adult. The last whorl is acutely keeled above the middle, thence to the base semiglobose. With the aid of a lens the surface is seen to be uniformly closely spirally striate.

Provisionally placed in *Zingis* till the anatomy is known. We have much pleasure in dedicating so interesting a form to its discoverer.

*Zingis inuncta**, sp. n. (Pl. III. fig. 4.)

Z. testa magna, paullulum umbilicata, delicata, depressa; anfractibus 5, tribus primis et basi nitentibus, lævibus, ultimo magno, effuso, haud nitente, sericato, sub lente spiraliter tenuissime

* *Inunctus*, from the want of polish on the last whorl.

striato, zona castaneo-brunnea supra medium pulchre succinato ;
apertura rotundo-lunari ; peristomate tenuissimo, margine columellari circa umbilicum parvum triangulatum reflexo.

Alt. 14, diam. 24 mm.

Hab. Umkomaas, Natal (*Burnup*) ; 'Nkandhla Forest, Zululand (*Haygarth*).

This fine species is at once distinguished from all its allies by the peculiar lustreless surface of the last whorl, which is encircled with numerous fine impressed revolving lines, producing a dull silky effect. It may be added that in one specimen the darker chestnut band, so conspicuous in the others, is but faintly observable.

Zingis ampliata, sp. n. (Pl. III. fig. 5.)

Z. testa nitidissima, minute perforata, perlaevi, tenui, globulari, succineo-olivacea ; anfractibus 4, apud suturas distincto impressis, ultimo magno, rapide accrescente, effuso ; apertura late ovato-rotunda ; peristomate tenui ; columella alba vix incrassata, super umbilicum minutum reflexa.

Alt. 12, diam. 16 mm.

Hab. Durban.

A particularly glossy amber-coloured species, very thin and smooth, which might indeed have been included in *Helicarion* were it not for the slightly thickened columella, which almost conceals the minute umbilicus.

*Trachycystis calorama**, sp. n.
(Pl. III. figs. 6-6 b.)

T. depresso-conica, obtecte perforata, tenui, pallide cinereo-olivacea ; anfractibus 6, gradatulis, tumidulis, undique longitudinaliter arcte obliquiliatis, liris setigeris, setis longis, nitidis, acutis, nigrescentibus, anfractu ultimo apud peripheriam rotundo-angulato ; apertura lunari ; peristomate tenui, marginem apud columellarem triangulatum reflexo.

Alt. 7, diam. 9 mm.

Hab. Near Pinetown, Natal.

A very neat and distinct *Trachycystis*, resembling *T. Planti*, Pfr., save for the exceedingly narrow and almost concealed perforation, the umbilicus in its ally being wider and far more conspicuous. The surface is entirely covered with an ashy-olivaceous epidermis, which is furnished with bristle-bearing, close, longitudinal, oblique liræ, these bristles being shining, long, blackish, and exceedingly acuminate.

* κάλος, ὄραμα, beautiful to behold.

Trachycystis pycnotricha *, sp. n.

(Pl. III. figs. 7-7 b.)

T. testa depresso-conica, profunde umbilicata, apice mamillato, lævi, pellucido-cinerea, epidermide fusca omnino contexta; anfractibus 5-6, paullulum tumidulis, longitudinaliter arcuissime et delicate obliquilatis, spiraliter minutissime arcistriatis, ultimo apud peripheriam acuticarinato, setifero; apertura ovato-lunari; peristomate simplici, margine columellari ad umbilicum fortiter triangulatim reflexo.

Alt. 4, diam. 6 mm.

Hab. Kowie River (*Cor*).

The acute keel distinguishes this from the majority of its allies, e. g. *T. trichostroma* and *strobilodes*, M. & P.; in form it perhaps most calls to mind *T. Alcocki*, M. & P., from which, however, it is at once distinguished by the more elaborate sculpture and the hairy epidermis.

Trachycystis ectima †, sp. n.

(Pl. III. figs. 8, 8 a.)

T. testa conica, subperforata, tenui, stramineo-cornea, apice tumido; anfractibus 5, apud suturas impressis, ventricosulis, arcu et delicate longitudinaliter obliquicostatis, costulis irregularibus; apertura ovato-lunari; peristomate tenui, regionem apud umbilicarem triangulatim reflexo.

Alt. 2, diam. 3.50 mm.

Hab. Umkomaas, Natal (*Burnup*).

Very small, but with the aid of a lens this little species is seen to merit the specific title assigned to it, being very delicately and closely obliquely ribbed, with somewhat irregularly placed liræ.

Trochomorpha placenta, sp. n. (Pl. III. fig. 9.)

T. testa umbilicata, pellucida, tenui, placentiformi, olivaceo-brunnea; anfractibus 5, supernis compressis, planatis, superficie undique oblique irregulariter lirata, et sub lente spiraliter delicatissime striatula, anfractu ultimo apud peripheriam acutissime carinato; apertura subquadrata; peristomate tenui, margine columellari paullum reflexo.

Alt. 4, diam. 11 mm.

Hab. 'Nkandhla Forest, Zululand.

A very remarkable form, unlike any other hitherto recorded from the South-African region.

* πύκνος, θρίξ, thickly bristled.

† ἑκρίμος, select.

Balea africana, sp. n. (Pl. III. fig. 10.)

B. testa sinistrorsa, fusiformi, haud profunde perforata, tenui, nitida, olivaceo-brunnea; anfractibus 7, apicali obtuso, cæteris apud suturas impressis, tumidulis, undique longitudinaliter ruguloso-striatis; apertura ovata; peristomate continuo, paullum incrassato. margine columellari intus indistincte et obtuse uniplicato, crassiusculo.

Long. 6, lat. 1.75 mm.

Hab. Van Rienen, Drakensberg Mountains (*Quekett*).

Another most interesting addition, generically, to the South-African fauna. From the few other *Baleæ* known to us this would seem to differ mostly in the shorter and less acuminate spire, more compressed growth, and in the very obscure character of the obtuse columellar fold. We should consider it a member of the typical section of the genus, with the European *B. perversa*, L., = *fragilis*, Fitz.

*Pupa cryptoplax**, sp. n. (Pl. III. figs. 11, 11 a.)

P. testa conico-pyramidata, valde et profunde perforata, tenui, olivaceo-brunnea, apice obtusissimo, planato; anfractibus 8, apud suturas impressis, undique sub lente obliquistriatis; apertura obliqua; peristomate fere continuo, albo, nitente, reflexo; plica parietali magna, acinaciformi, columellari perintrante, conspicua, acuta, intus duplicata; dente labiali parvo, albo, obtuso.

Long. 3.50, lat. 2 mm.

Hab. Kragga Kanma, Port Elizabeth.

One of the most abnormal of the genus, and perhaps worthy of special subgeneric rank. We figure an example broken away (fig. 11 a) so as to show the duplicated internal columellar fold.

Curvella sinuosa, sp. n. (Pl. III. fig. 12.)

C. testa fusiformi, nitida, tenui, pallide et læte straminea; anfractibus (incluso apice papillari, obtuso, lævissimo) 7, apud suturas impressis, fere lævibus, sub lente longitudinaliter flexuoso-striatulis; apertura ovata; peristomate sinuato, simplici, margine columellari recto.

Long. 6.50, lat. 3 mm.

Hab. Umkomaas, Natal.

An elongate fusiform *Curvella*, quite distinct from the two other recently described species (*catarractæ* and *globosa*,

* κρυπτόπλαξ, with hidden plicæ.

M. & P.), but equally delicate and remarkable. The chief peculiarity of the shell now before us is, as indicated by the specific name, its sinuous lip.

Auricula catonis, sp. n. (Pl. III. fig. 13.)

A. testa oblongo-cylindracea, angusta, nitida, perlævi, pallide olivacea; anfractibus (in speciminibus nostris decollatis) verisimiliter quinque, tribus ultimis apud suturas irregulariter impressis, ultimo elongato, recto, cylindriformi; apertura anguste oblonga, alba, labro exterioro recto, simplici; columella paullum incrassata, haud nitente, biplicata.

Long. 9, lat. 4 mm.

Hab. Cato's Creek, Durban (*Burnup*).

The few examples we have seen of this species are uniformly decollate, but the whorls would probably be five in number in perfect specimens*. The only two *Auriculæ* comparable with this and the following species (*A. durbanica*) are *pellucens*, Mke., and *tornatelliformis*, Pet. To the former we have just referred in the Addenda to our Check-list (*vide supra*); the latter is a larger species altogether, and much more angled at the superior part of the body-whorl.

Auricula durbanica, sp. n. (Pl. III. fig. 14.)

A. testa oblonga, lævi, paullum nitida, pallide olivacea, apice decollato; anfractibus verisimiliter 5, apud suturas irregulariter impressis, levibus, vel indistincte longitudinaliter striatulis, ultimo lato; apertura anguste oblonga; peristomate tenui, simplici; columella vix nitente, albida, oblique biplicata.

Long. 11·50, lat. 5·50 mm.

Hab. Cato's Creek, Durban (*Burnup*).

This species differs from *A. catonis*, just described, in its stouter and broader build, the last whorl being decidedly shouldered just below the sutures, and also in its larger size throughout. The spire, too, seems more attenuate, and the aperture, though narrow, broader than in *A. catonis*, especially towards the base. *A. tornatelliformis*, Petit, with which our species is also comparable, has the base of the aperture broader and rounder and the last whorl more conspicuously shouldered. The whorls are likewise spirally wrinkled just below the sutures in Petit's species.

* The figures of these two *Auriculæ* do not show the decollation.

EXPLANATION OF PLATE III.

- Fig. 1. *Ennea microthauma*
 Fig. 2. — *justidens*
 Fig. 3. *Zangis Haygarthi*.
 Fig. 4. — *inuncta*.
 Fig. 5. — *amplata*.
 Figs. 6, 6 a, 6 b. *Trachycystis calorama*.
 Figs. 7, 7 a, 7 b. — *pyncotricha*.
 Figs. 8, 8 a — *ectima*
 Fig. 9. *Trochomorpha plaventa*.
 Fig. 10. *Balea africana*.
 Figs. 11, 11 a *Pupa cryptoplaa*
 Fig. 12. *Currella sinuosa*.
 Fig. 13. *Auracula catonis*.
 Fig. 14. — *durbanica*
 Fig. 15. *Cyclophorus muumius*, M & P. Operculum
 Figs. 16, 16 a, 16 b *Trachycystis charybdis*, Benson

XVII.—Descriptions of some new Species of Heterocera.

By HERBERT DRUCE, F.L.S. &c.

Fam. Lithosiidæ.

Chionæma sumatrensis, sp. n.

Male.—The head, collar, and tegulæ white, the collar and tegulæ edged with yellow; the thorax and basal half of the abdomen white, the anal half of the abdomen yellow; antennæ, palpi, and legs yellow. Primaries white, crossed from the costal to the inner margin by three waved yellow lines; two small black dots at the end of the cell and a short yellow streak in the cell; the outer margin bordered from the apex to the anal angle with yellow; the fringe white: secondaries white, shaded with yellow at the apex and partly round the outer margin.—*Female* very similar to the male, but with the markings all red instead of yellow; the secondaries salmon-colour, with the fringes white.

Expanse, ♂ $1\frac{1}{2}$, ♀ $1\frac{3}{4}$ inch.

Hab. Sumatra, Pedang (*Bock, Mus. Druce*).

Lithosia subcosteola, sp. n.

Male.—The head, antennæ, and legs black; collar, tegulæ, and thorax yellow; abdomen greyish black, the sides and anus yellow. Primaries greyish black, yellow at the base and streaked along the costal margin from the base to the apex with yellow: secondaries pale yellow.

Expanse $1\frac{1}{8}$ inch.

Hab. Central China, Hunan (*Pratt, Mus. Druce*).

Ilema perdentata, sp. n.

Female.—The head, antennæ, collar, thorax, and tegulæ pale yellow; abdomen dusky. Primaries pale semihyaline yellow, crossed from the costal to the inner margin by two zigzag dusky brown bands, the first close to the base, the second about the middle, the outer margin striated with dusky brown lines: secondaries pale yellow.

Expanse 1 inch.

Hab. Perak (*Doherty, Mus. Druce*).

Scoliacma brunnea, sp. n.

Female.—The head, collar, and tegulæ chrome-yellow; antennæ brown; thorax and abdomen above black, on the underside chrome-yellow; legs brown; the anus yellow. Primaries brown, slightly yellow at the base: secondaries blackish brown.

Expanse $1\frac{1}{4}$ inch.

Hab. New Guinea, Port Moresby (*Goldie, Mus. Druce*).

Fam. *Ægeriidæ*.

Ægeria calamis, sp. n.

Male.—The head, thorax, and tegulæ black, the tegulæ edged with yellow; collar yellow; antennæ black, the tip yellow; abdomen black, banded with yellowish white, the anal tuft yellow; legs black, banded with yellow. Primaries and secondaries hyaline, the veins black; the outer margin of the primaries bordered with pale brown; the fringes of both wings black.

Expanse 1 inch.

Hab. Perak, 2000–3500 feet (*Doherty, Mus. Druce*).

Ægeria simois, sp. n.

The head, antennæ, thorax, abdomen, and legs black; the last three segments of the abdomen banded with yellow, the anal tuft black. Primaries and secondaries hyaline, the veins black; the costal margin, inner margin, and apex black.

Expanse $\frac{3}{4}$ inch.

Hab. N.E. Borneo, Sandakan (*Mus. Druce*).

Ægeria panyasis, sp. n.

Male.—The head, thorax, and abdomen glossy steel-blue; the tegulæ edged with yellow; each segment of the abdomen

edged with yellow, the anal tuft black; legs black, banded with yellow; antennæ black, tipped with white. Primaries and secondaries hyaline, the costal margin, outer margin, and veins black; a small yellow spot on the black border close to the apex; the fringes of both wings black.

Expanse $\frac{3}{4}$ inch.

Hab. Queensland, Brisbane, Taylor Range (*Mus. Druce*).

Ægeria caleta, sp. n.

The head and thorax metallic blue; antennæ black; tegulæ, sides of the thorax, abdomen, and legs bright yellow, the abdomen with three bands of metallic blue. Primaries hyaline, the base yellow; the veins, costal margin, apex, and inner margin black; a rather large yellow mark at the apex; the fringe black: secondaries hyaline, the veins and fringe black.

Expanse $\frac{3}{4}$ inch.

Hab. Queensland, Brisbane, Taylor Range (*Mus. Druce*).

Ægeria elymais, sp. n.

The head and thorax black; antennæ black, with a ring of yellow near the tip; collar and tegulæ yellow; abdomen yellow, the last three segments edged with black, the anal tuft yellow; legs yellow. Primaries hyaline yellow at the base and from the end of the cell to the outer margin; a black spot at the end of the cell; the veins and fringe black: secondaries hyaline, the costal margin yellow, the fringe black.

Expanse $\frac{3}{4}$ inch.

Hab. E. Africa, Delagoa Bay (*Mrs. Monteiro, Mus. Druce*).

Ægeria tiresa, sp. n.

The head, antennæ, thorax, tegulæ, and abdomen all black, the first and fourth segments of the abdomen banded with white; the anal tuft black, white at the base; the legs alternately black and white. Primaries glossy black: secondaries hyaline, the veins and fringe black.

Expanse $\frac{1}{2}$ inch.

Hab. E. Africa, Delagoa Bay (*Mrs. Monteiro, Mus. Druce*).

Ægeria critheis, sp. n.

The head, antennæ, tegulæ, thorax, abdomen, and legs black, the fourth segment of the abdomen yellow. Primaries

dull black, with a small indistinct yellow spot close to the apex; the fringe black: secondaries hyaline, the veins, outer margin, and apex black.

Expanse $\frac{3}{4}$ inch.

Hab. E. Africa, Delagoa Bay (*Monteiro, Mus. Druce*).

Ægeria rhodia, sp. n.

The head, antennæ, thorax, abdomen, and legs black, the anal tuft black. Primaries hyaline, the costal margin, inner margin, and the apex black; a black band crossing the wing at the end of cell and a greyish line extending from the apex to the anal angle; the fringe black: secondaries hyaline, the veins, outer margin, and fringe black.

Expanse $\frac{3}{4}$ inch.

Hab. South Africa, Bedford (*Mus. Druce*).

Ægeria sophax, sp. n.

The head and antennæ black, the thorax and tegulæ glossy dark green; the abdomen bright red, with the fourth segment dark green; the legs blue-black, banded with white. Primaries hyaline red at the base; the costal margin, a streak at the end of the cell, and all the veins black: secondaries hyaline, the veins black.

Expanse $\frac{3}{4}$ inch.

Hab. E. Africa, Delagoa Bay (*Mrs. Monteiro, Mus. Druce*).

A specimen of this species is in the National Collection from the same locality.

Ægeria pitheis, sp. n.

The head, thorax, and antennæ black; front of the head and underside of the thorax yellow; tegulæ black, edged with yellow; collar yellow; abdomen brownish black, each segment edged with yellow, some wider than others; the anal tuft brownish yellow; legs yellow. Primaries hyaline, the costal margin and the apex brown; a black streak at the end of the cell: secondaries hyaline, the veins and outer margin brownish yellow.

Expanse $\frac{3}{4}$ inch.

Hab. Amazons, Ceara (*Leech, Mus. Druce*).

Ægeria chea, sp. n.

The head, antennæ, thorax, tegulæ, and abdomen black, the anal tuft black; the legs yellow, banded with black.

Primaries and secondaries hyaline, the costal margin of the primaries and the veins of both wings all black.

Expanse $\frac{1}{2}$ inch.

Hab. Amazonas (*Leech, Mus. Druce*).

Ægeria Whitelyi, sp. n.

The head, antennæ, and tegulæ black; the thorax brown; abdomen black, each segment edged with yellowish brown; a large yellowish-brown spot on the second segment; the anal tuft brown and black; the legs yellowish brown. Primaries hyaline, the costal margin, the veins, and the apex black; a black streak at the end of the cell, the inner margin shaded with yellow: secondaries hyaline, the veins and the outer margin black.

Expanse 1 inch.

Hab. British Guiana (*Whitely, Mus. Druce*).

Ægeria Harti, sp. n.

The head, antennæ, collar, and thorax black; tegulæ black, edged with yellow; palpi black, white on the under-side; abdomen glossy blue-black, the base, second and fourth segments banded with yellow; the anal tuft blue-black; legs black, banded with yellow. Primaries and secondaries hyaline, the veins of both wings and the apex of the primaries all black.

Expanse $\frac{3}{4}$ inch.

Hab. Trinidad, Port of Spain (*Hart, Mus. Druce*).

Ægeria (?) *Taylori*, sp. n.

The head, antennæ, thorax, and the base of the abdomen reddish brown, the collar white, and the last four segments blackish brown, edged with white; the anal tuft black; legs black, banded with white. Primaries hyaline, the veins and apex reddish brown; a black line at the end of the cell, edged with red on the outer side: secondaries hyaline, the veins reddish brown; a small red spot at the end of the cell; the fringe dark brown.

Expanse 1 inch.

Hab. South Africa, Potchefstroom (*Taylor, Mus. Druce*).

Ægeria pythes, sp. n.

The head, antennæ, collar, tegulæ, thorax, and abdomen black; the palpi reddish brown; the anal tuft black and yellow; the legs reddish brown. Primaries blackish brown,

darkest at the base; a round black spot at the end of the cell: secondaries hyaline, the veins and fringe dark brown.

Expanse $\frac{3}{4}$ inch.

Hab. South Africa, Bedford (*Mus. Druce*).

Egeria marisa, sp. n.

The head, antennæ, tegulæ, thorax, and abdomen dark brownish black, the tegulæ edged with yellow, the collar yellow; legs yellow, banded with black. Primaries hyaline, the veins, a streak at the end of the cell, and the fringe reddish brown: secondaries hyaline, the veins and fringe dark brown.

Expanse 1 inch.

Hab. South Africa, Bedford (*Mus. Druce*).

Ceratocorema aurania, sp. n.

The head, antennæ, collar, tegulæ, thorax, and abdomen black, the fourth and fifth segments of the abdomen bright red; anal tuft black; legs black. Primaries yellowish hyaline, the costal margin and the apex brown; the veins yellowish brown: secondaries yellowish hyaline, the veins and fringe brown.

Expanse $1\frac{1}{4}$ inch.

Hab. Perak, 2000–3500 feet (*Doherty, Mus. Druce*).

Melittia dolens, sp. n.

The head, thorax, tegulæ, abdomen, and legs black (antennæ wanting); the fourth segment of the abdomen bright yellow; the anal tuft black. Primaries black; secondaries hyaline, the veins and the fringe black.

Expanse $1\frac{1}{4}$ inch.

Hab. S.E. Brazil (*Mus. Druce*).

XVIII.—*Revision of Amphipoda (continued)*.*

By the Rev. THOMAS R. R. STEBBING, M.A., F.R.S.

THE following new genera are proposed:—

Fam. *Lysianassidæ*.

STOMACONTION, gen. nov.

Agreeing in general with *Acontistoma*, but distinguished by having the palp of the first maxillæ two-jointed, the fourth

* See the 'Annals' for March and April 1899.

joint in the palp of the maxillipeds rudimentary, and the third uropods ending in a tubercular ramus.

The type species is *Acontiosoma Pepinii*, Stebbing, of which *A. kergueleni* is a synonym.

PAROPISA, gen. nov.

Distinguished from *Opisa*, Boeck, by having the first side-plates broader and deeper than the second and third, the second joint of the fifth peræopods produced strongly downward, the rami of the third uropods not much longer than the peduncle; the telson as broad as long, cleft only to the centre.

The type species is *Opisa hispana*, Chevreux, of which the mouth-organs have not yet been described.

PARATRYPHOSITES, gen. nov.

Near to *Tryphosites*, Sars, and *Hippomedon*, Boeck, but distinguished by the small first joint of the flagellum of the first antennæ, the more numerous setæ (five) on the inner plate of the first maxillæ, the stouter peræopods, and the telson less deeply divided, with several spinules on the truncate apices. From *Hippomedon* it is further distinguished by the distinctly subchelate first gnathopods.

The type species is *Lysianassa abyssi*, Goës.

Fam. Stegocephalidæ.

PARANDANIA, gen. nov.

Pleon rather large. Second antennæ with flagellum longer than the peduncle. Lower lip with the lobes very broad, distally truncate, and having a denticle at the outer corner. Mandibles with the cutting-edge very broad, straight, and smooth. The palp of the first maxillæ one-jointed. The telson entire.

The type species is *Andania Boeckii*, Stebbing.

EUANDANIA, gen. nov.

In general agreement with *Parandania*, but distinguished by having a far smaller pleon, the flagellum of the second antennæ shorter than the peduncle, the lower lip with the lobes broadly rounded, the telson partly cleft.

The type species is *Andania gigantea*, Stebbing.

Fam. Phoxocephalidæ.

PARHARPINIA, gen. nov.

Hood obtuse. Eyes distinct. Mandibles with the molar small or obsolete, third joint of the palp longer than the second. First maxillæ with the palp two jointed. Maxillipeds with outer plate elongate and fourth joint of the palp long and slender. The third and fourth peræopods have the fourth and fifth joints not expanded. Telson deeply cleft.

The type species is *Phoxus villosus*, Haswell, if I am right in identifying with that species the *Phoxus Batei* of G. M. Thomson, a New Zealand species, for the opportunity of examining which I am indebted to Mr. Thomson.

Fam. Amphiloichidæ.

TETRADEION, gen. nov.

Pleon short. First four side-plates with neatly fitting margins, together forming a continuous shield; fourth pair much longer than first to third combined, fifth much longer than deep, sixth and seventh concealed. Eyes distinct. Antennæ small, first without accessory flagellum. Mouth-parts unknown. First and second gnathopods imperfectly subchelate. Peræopods slender. Third uropods not reaching so far back as the two preceding pairs, the rami unequal. Telson entire.

The generic name is from the Greek τετραδείον, a set of four, in allusion to the combination of the first four side-plates.

The type species is "*Cyproidia ? crassa*," Chilton, found in Lyttelton Harbour, New Zealand.

PARACYPROIDEA, gen. nov.

In general like *Cyproides*, Haswell, but the mandibles have a well-developed molar, the apex of the inner plates in the maxillipeds is transversely truncate, the first and second gnathopods are much more slender, rather feebly subchelate, the fourth joint of the first pair produced along the fifth, as in the male of *Aora*, Kroyer; the uropods have their respective rami subequal, those of the first and second pairs reaching little beyond the third, and the telson is very large, strongly compressed laterally, extending back almost to the extremity of the uropods.

The type species is *Cyproidia lineata*, Haswell, for specimens of which I am indebted to Professor Haswell, F.R.S., and to the Trustees of the Australian Museum, Sydney.

Fam. *Leucothoidæ*.

PARALEUCOTHOE, gen. nov.

First segment of peræon longer than the second. First maxillæ with five seta-like spines on the outer plate, the palp very large, but only one-jointed. The maxillipeds have the inner plates broad and long, peculiarly constructed, so as to show two apical margins, one flattened, the other compressed; the outer plates, though small, are not rudimentary. The first gnathopods are chelate between the fifth and sixth joints, the sixth having a truncate apex, grooved for the finger. The second gnathopods are subchelate, the fifth joint not strongly produced. Telson triangular, oval.

The type species is *Leucothoe novæ-hollandiæ*, Haswell. For opportunities of examining this interesting form I have to thank Professor Haswell and the Trustees of the Australian Museum.

Fam. *Ædiceridæ*.

EXÆDICEROS, gen. nov.

Distinguished from *Ædiceros*, Krøyer, by having the rostrum little pronounced, the eyes not contiguous though well developed, the first antennæ with a rudiment of an accessory flagellum, the mandibles with well-developed molar and the palp's second and third joints broad; the first maxillæ with numerous setæ fringing the inner plate; the maxillipeds with the inner plates broad; the gnathopods with the fifth joint at least as large as the sixth; the first and second peræopods without finger and the second uropods not reaching back so far as the first or third.

The type species is *Ædicerus fossor*, Stimpson, if, as I suppose, that species is the same as *Ædiceros arenicola* (?*fossor*), Haswell. The latter has been kindly sent me by the Trustees of the Australian Museum.

CAROLOBATEA, gen. nov.

Frontal process apically subacute, carrying the contiguous eyes. Fourth pair of side-plates much deeper than the rest. First antennæ shorter than the second, flagella in both many-jointed. Lower lip with the inner lobes separate. Mandibles with molar rather weak, second joint of palp slightly curved. Outer plate of first maxillæ with nine spines. Second maxillæ with inner plate the broader. Maxillipeds with inner plates small and outer plates not nearly reaching apex of the distally

expanded second joint of the palp. First and second gnathopods with fifth joint subequal to sixth, the palm nearly transverse. First to fourth peræopods with membranous cap over tip of the narrowly boat-shaped finger. Third uropods with rami subequal to the peduncle. Telson rather longer than broad.

The generic name is in recollection of the late Charles Spence Bate.

The type species is *Halimедon Schneideri*, Stebbing.

Fam. Pleustidæ.

MESOPLEUSTES, gen. nov.

Body carinate, integument indurated. Rostrum large. First to fourth side-plates distally narrowed. Upper lip with small oblique incision. Mandibles with molar prominent, strong, oval. First maxillæ with four setæ on the inner plate. Maxillipeds with outer plates scarcely reaching beyond the first joint of the palp, the finger strong. The gnathopods subchelate, strong, second pair the larger. Peræopods robust, subequal. Telson subrotund.

The type species is *Pleustes abyssorum*, Stebbing.

SYMPLEUSTES, gen. nov.

Rostrum small. Upper lip with oblique incision. Mandibles with molar strong, oval. First maxillæ with two setæ on the inner plate. Maxillipeds with finger slight. Second gnathopods usually much stronger than the first and more distinctly subchelate.

To this genus I refer *Amphithoe latipes*, M. Sars, *Amphithopsis glaber*, Boeck, *Amphithopsis pulchella*, G. O. Sars, *Amphithopsis Olrikii*, Hansen, and *Amphithopsis grandimana*, Chevreux.

Fam. Calliopidæ.

PARALEPTAMPHOPUS, gen. nov.

Body without dorsal dentation. First antennæ the longer, with small accessory flagellum. Lower lip without inner lobes. Mandibles with third joint of palp shorter than the second. First maxillæ with many setæ on the inner plate; second maxillæ with setæ fringing the inner margin of the inner plate. Maxillipeds with outer plates not reaching the apex of the palp's second joint. Gnathopods subchelate,

fifth joint of second pair rather long. Fifth peræopods normal. Third uropods with equal rami. Telson entire

In this genus I place *Calliope subterranea*, Chilton, and *Pherusa cærulea*, G. M. Thomson; but the form which Dr. Chilton regards as the adult male of his *Calliopius subterraneus* I leave at present unclassified. In quoting species as typical of new genera I have given the earliest name published, it not being desirable to burden the present paper with synonymy.

PARACALLIOPE, gen. nov.

Body without dorsal dentation. First antennæ the shorter, without accessory flagellum. Lower lip with inner lobes. Mandibles with third joint of palp at least as long as second. First maxillæ with many setæ on the inner plate. Second maxillæ with setæ fringing the inner margin of the inner plate, which is the narrower. Maxillipeds with inner plates rather broad, outer plates reaching the apex of the palp's second joint. Second gnathopod stronger than first and more strongly subchelate. Fifth peræopods much the longest, with the finger long, straight, spinose. Uropods with slender rami, those of the third pair equal, not longer than the peduncle. Telson short, entire.

The type species is *Calliope fluviatilis*, G. M. Thomson, with which I consider *Pherusa australis*, Haswell, identical; and I also think it quite possible that both are synonyms of *Ædicerus novæ-zealandiæ*, Dana.

Fam. Dexaminidæ.

PARADEXAMINE, gen. nov.

In general character like *Dexamine*, Leach, but the lower lip has the inner lobes well developed and the mandibular processes upturned; the first maxillæ have a one-jointed palp uniform on the right and left maxilla, and the maxillipeds have a small distinct finger to the palp.

The type species is *Dexamine pacifica*, G. M. Thomson, which, through the kindness of my friends, I have received both from New Zealand and from Jervis Bay, Australia.

Here it may be mentioned that I find it expedient definitely to establish the family Anamixidæ, already suggested in 1897, and to institute various new families, namely:—Metopidæ, to include the genera *Metopa*, Bocck, *Metopella*, Sars, *Metopoides*, Della Valle, and *Proboloides*, Della Valle;

Cressidæ, for the genus *Cressa*, Boeck; *Laphystiopsidæ*, for the genus *Laphystiopsis*, Sars; *Colomastigidæ**, for the genus *Colomastix*, Grube; *Liljeborgiidae*, in accordance with a suggestion made by Professor Sars ('Crustacea of Norway,' vol. i. p. 530), to receive the genera *Liljeborgia*, Bate, and *Idunella*, Sars; *Melphidippidæ*, again in accordance with a suggestion by Sars ('Crustacea of Norway,' vol. i. p. 481), to receive the genera *Melphidippa*, Boeck, and *Melphidippella*, Sars; *Aoridæ*, for *Aora*, Kröyer, and various other genera in which the first gnathopod is larger than the second; *Amphithoidæ*, for *Amphithoe*, Leach, and genera closely connected with it; and *Ischyroceridæ*, to receive *Ischyrocerus*, Kröyer, and neighbouring genera, which can no longer be grouped under the heading *Podoceridæ*, now that the genus *Podocerus* has been removed from the family.

In compensation for all these additions to nomenclature I can only offer a very trifling reduction by cancelling a single genus and a single species. I now feel convinced that *Tryphosa antennipotens*, Stebbing, is identical with the rather erratically described *Uristes gigas*, Dana; and as I agree with Sars that *Tryphosa antennipotens* "quite undoubtedly" belongs to the same genus as his *Pseudotryphosa umbonata*, it follows that *Pseudotryphosa* must become a synonym of *Uristes*, Dana, that genus containing the two species *Uristes gigas*, Dana, and *Uristes umbonatus* (Sars).

XIX.—On the Giraffe of Somaliland.

By W. E. DE WINTON.

In the 'Proceedings of the Zoological Society' for 1897, pp. 273–283, I gave a report on the existing forms of Giraffe. Since then, consequent on the opening up of communications with the interior of Africa, many more specimens have been added to the museums of Europe. It should be mentioned that separate local forms have been described by Mr. O. Thomas from Nigeria and by Herr Matschie from German East Africa. I hope shortly to be able to give fuller descriptions of the forms which are found in the different regions of Africa.

In the meantime I wish to notice a very distinct local race, and so correct a statement in my former paper which may cause confusion if not rectified.

* *Colomastidæ*, Chevreux, 1899, is named in the 'Comptes rendus de l'Assoc. Française,' Congrès de Nantes, 1898.

The specimen figured in the P. Z. S. 1897, p. 280, as typical of the northern form is found to be very distinct from the true *Giraffa camelopardalis* from Senaar and the adjacent countries, and in reality to be a strikingly different animal, which I consider well worthy of a separate name.

The first specimen known to science was that referred to in P. Z. S. 1894, p. 135, collected by Major C. E. W. Wood and Capt. M. B. Finch in Somaliland, which was brought to the notice of Mr. O. Thomas by Messrs. Rowland Ward, of Piccadilly.

Dr. Donaldson Smith obtained the second, the head of which is now mounted in the Academy of Natural Science, Philadelphia, U.S.A. Then came Mr. Arthur Neumann, who discovered this animal in the Loroghi Mountains; he was the first collector to bring home fully adult specimens, together with younger animals, and to direct attention to the peculiarity of this form. Since then numerous specimens have been received, among others from Mr. Cavendish and Mr. Andrew; and quite lately Lord Delamere has brought home a fine series, some of which, notably a fine head and neck mounted, have been presented to the National Collection.

Excepting for the white ears and legs below the knees and hocks, and the spotted head and upper neck, this Somaliland giraffe might be described as a liver-red animal with a coarse network of narrow white lines dividing the body-colour into large sharply defined patches; there is none of the paler blotched marking of the typical form from the Nile Valley.

Original accounts of this giraffe, written by various sportsmen, also extremely interesting photographs by Lord Delamere of the animal in its native haunts, will be found in Messrs. Rowland Ward's fine new book, 'The Great and Small Game of Africa.' The view of giraffes feeding, on p. 493, shows how marvellously the markings on the hide of the animals correspond with the mottling of light and shade in the mimosa-forest.

All the specimens received have been so uniform in coloration and pattern of marking that there can be no doubt that the Somaliland giraffe is a well-defined local race, and I propose provisionally to connect it with the northern form as a subspecies, giving it the name of *Giraffa camelopardalis reticulata*, and taking as the type Mr. Arthur Neumann's specimen no. 97. 1. 30. 1 (skull, scalp, and piece of neck-skin) in the British Museum, figured in the P. Z. S. 1897, p. 280.

XX.—*Rhynchotal Notes*.—Heteroptera: Plataspinae,
Thyreocorinae, and Cydninae. By W. L. DISTANT.

THE following notes, descriptions, and synonymy are in continuation of my previous paper (*ante*, pp. 29–52).

PLATASPINÆ.

GENUS BRACHYPLATYS.

Brachyplatys pallipes.

Cimex pallipes, Fabr. Sp. Ins. ii. p. 343 (1781).

Brachyplatys calabarica, Walk. Cat. Het. i. p. 99. n. 4 (1867).

Brachyplatys negamica, Walk. loc. cit. p. 99. n. 5.

Brachyplatys subæneus.

Plataspis subænea, Westw. in Hope, Cat. Hem. i. p. 17 (1837).

Brachyplatys bistriga, Walk. Cat. Het. p. 100. n. 12 (1867).

Brachyplatys cambodica, Walk. loc. cit. p. 101. n. 13.

Brachyplatys cognata, Walk. loc. cit. p. 101. n. 14.

Brachyplatys adjuncta, Walk. loc. cit. p. 101. n. 15.

Brachyplatys contigua, Walk. loc. cit. p. 103. n. 24.

Brachyplatys papuus.

Scutellera papua, Guér. Voy. Coq., Ent. p. 157, pl. xi. f. 6 (1830).

Brachyplatys rutilinea, Walk. Cat. Het. i. p. 105. n. 30 (1867).

Brachyplatys deplanatus.

Scutellera deplanatus, Eschscholtz, Dorpat Abhandl. i. p. 158. n. 74 (1822).

Brachyplatys paucifera, Walk. Cat. Het. i. p. 105. n. 29 (1867).

Brachyplatys pallifrons.

Brachyplatys pallifrons, Vollenh. Faun. Ind. Neerl. i. p. 55, pl. iv. f. 10 (1863).

Brachyplatys indotata, Walk. Cat. Het. i. p. 104. n. 26 (1867).

Brachyplatys pacificus.

Brachyplatys pacifica, Dall. List Hem. i. p. 70. n. 8 (1851).

Brachyplatys intacta, Walk. Cat. Het. i. p. 106. n. 32 (1867).

Brachyplatys cupreata, Walk. loc. cit. p. 107. n. 37.

Brachyplatys interrupta, Walk. Cat. Het. i. p. 106. n. 31 (1867).

The typical and sole specimen under this name in the British Museum is without either head or thorax. Judging from the abdomen alone it is very near, if not identical with, *B. pacificus*, Dall.

*Brachyplatys silphoides.**Cimer silphoides*, Fabr. Ent. Syst. iv. p. 86. 24 (1794).*Brachyplatys liturifrons*, Walk. Cat. Het. i. p. 102. n. 22 (1867).*Brachyplatys carolinæ.**Brachyplatys carolinæ*, Atkins. J. Asiat. Soc. Beng. lvii. p. 341 (1889).*Brachyplatys silphoides*, Dall. (nec Fabr.) List Hem. i. p. 71. n. 13 (1851).*Brachyplatys silphoides*, Walk. (nec Fabr.) Cat. Het. i. p. 10. n. 9 (1867).*Brachyplatys cingalensis.**Brachyplatys cingalensis*, Stål, Öfv. Vet.-Ak. Förh. 1855, p. 181; loc. cit. 1856, p. 54.*Brachyplatys silphoides*, Kirby (nec Fabr.), Journ. Linn. Soc., Zool. vol. xxiv. p. 70 (1891).*Brachyplatys pauper.**Brachyplatys pauper*, Vollenh. Faun. Ind. Neerl. i. p. 54 (1863).*Brachyplatys quinque-punctata*, Walk. Cat. Het. i. p. 103. n. 23 (1867).*Brachyplatys VahlII.**Cimer VahlII*, Fabr. Mant. ii. p. 283 (1787).*Brachyplatys continua*, Walk. Cat. Het. p. 104. n. 27 (1867).*Brachyplatys frontalis*, Walk. loc. cit. p. 103. n. 33.*Brachyplatys æneus.**Brachyplatys ænea*, Dall. List Hem. i. p. 71. n. 12 (1851).*Brachyplatys niger*, Atkins. J. Asiat. Soc. Beng. lvii. p. 342 (1889).

Types of both species are in the British Museum.

It is quite probable that this species is synonymic with *B. nitidus*, Westw., the single typical specimen of which in the Hope Collection is in indifferent condition.

Genus TIAROCORIS.

*Tiarocoris basistigma.**Coptosoma basistigma*, Walk. Cat. Het. i. p. 98. n. 67 (1867).

Genus SPATHOCRATES.

*Spathocrates histeroides.**Brachyplatys histeroides*, Walk. Cat. Het. i. p. 107. n. 34 (1867).

Genus COPTOSOMA.

*Coptosoma transversa.**Coptosoma transversa*, Westw. in Hope Cat. i. p. 17 (1837).*Coptosoma hilaris*, Walk. Cat. Het. i. p. 85. n. 18 (1867).*Coptosoma partita*, Walk. loc. cit. p. 85. n. 20.

*Coptosoma bipustulata.**Thyreocoris bipustulatus*, Germ. Zeitschr. i. p. 80. n. 14 (1839)*Coptosoma scitula*, Walk. Cat. Het. i. p. 86. n. 21 (1867).*Coptosoma marginella.**Coptosoma marginellum*, Dall. List Hem. i. p. 64. n. 9 (1851).*Coptosoma bipustulatum*, Dall. (nec Germ.) loc. cit. p. 64. n. 8.*Coptosoma nubila.**Thyreocoris nubilus*, Germ. Zeitschr. i. p. 26 (1839)*Coptosoma repleta*, Walk. Cat. Het. i. p. 85. n. 19 (1867)*Coptosoma cribraria.**Cimex cribrarius*, Fabr. Ent. Syst., Suppl. p. 551 (1798).*Coptosoma xanthochlora*, Walk. Cat. Het. i. p. 87. n. 35 (1867).*Coptosoma proxima.**Coptosoma proxima*, Walk. Cat. Het. i. p. 94. n. 55 (1867).*Coptosoma polyaspila*, Walk. loc. cit. p. 524 (1868).*Coptosoma apicifera.**Coptosoma apicifera*, Walk. Cat. Het. iii. p. 526 (1868).*Coptosoma erythropsila*, Walk. loc. cit. p. 526.*Coptosoma assamensis.**Coptosoma assamensis*, Atkins. Proc. Asiat. Soc. Beng. 1886, p. 174.*Coptosoma circumscriptum*, Dall. (nec Germ.) List Hem. i. p. 63. n. 3 (1851).

Lethierry and Severin have incorrectly included the species identified by Dallas as *C. circumscriptum*, Germ., as a synonym of *C. nepalensis*, Westw.

*Coptosoma sphaerula.**Thyreocoris sphaerula*, Germ. Zeitschr. i. p. 25 (1839).*Coptosoma sphaerula*, Leth. & Sev. Cat. Gén. Hém. i. p. 9 (1893).*Coptosoma siamica*, Walk. Cat. Het. i. p. 89. n. 39 (1867).*Coptosoma orbicula*, Walk. Cat. Het. i. p. 91. n. 47*Coptosoma concinnula*, Walk. loc. cit. p. 94. n. 54*Coptosoma bellula*, Walk. loc. cit. p. 94. n. 56.*Coptosoma inclusa*, Walk. loc. cit. p. 95. n. 57.*Coptosoma Saundersi*, Leth. & Sev. Cat. Gén. Hém. i. p. 9 (1893).*Coptosoma blandula*, Walk. loc. cit. p. 96. n. 61.*Coptosoma microstigma*, Walk. loc. cit. iii. p. 525 (1868).*Coptosoma pygmaeum*, Montandon, Ann. Soc. Ent. Belg. xl. p. 120 (1896).

The type of *C. minima*, Atkins., and a co-type of *C. pygmaeum*, Montand., which are now before me, exactly agree

with each other. All Walker's contributions to the synonymy of the species as detailed above agree with this form of *C. sphærulea*.

Coptosoma rugulosa, sp. n.

Ochraceous, thickly, irregularly, and somewhat confluent covered with coarse reticulated black punctures. Head with the central lobe distinctly margined with black punctures; eyes testaceous. Pronotum with the anterior margin concave, the anterior angles dilated, rounded, and moderately laminate, the lateral margins slightly sinuate; transverse furrow only slightly indicated. Scutellum without perceptible transverse basal furrow. Body beneath very dark dull olivaceous; abdomen with a marginal series of about three rows of small dark ochraceous spots. Legs dark castaneous, femora streaked with ochraceous. Head beneath ochraceous at base.

Somewhat allied to *C. cicatricosa* by the shape of the pronotum, which, however, lacks the distinct transverse furrow in that species.

Long. 6 millim.; lat. 5 millim.

Hab. Ceylon. (Type, Brit. Mus.)

This species formed part of the Atkinson Collection.

Coptosoma W.?

Coptosoma W., Montand. Rev. d'Entomol. xii. p. 237 (1893).

Black, shining; lateral lobes of head in front of eyes (excluding their extreme outer margins), lateral margins of pronotum divided by a central black line, and two small spots behind head ochraceous. Scutellum with two large central basal spots, two large apical subquadrate spots united on apical margin and connected with the narrow lateral margins, ochraceous. Body beneath black; head beneath, rostrum, legs, and a marginal series of large bifid ray-like spots to abdomen ochraceous.

Long. 4 millim.

Hab. Assam, Margherita. (Brit. Mus.)

From the Atkinson Collection.

Coptosoma ramosa.

Coptosoma ramosa, Walk. Cat. Het. i. p. 93 (1867).

Coptosoma Loricæ, Montd. Ann. Mus. Genov. xxxiv. p. 415 (1895).

The only difference in the form described by Montandon as *C. Loricæ* is in the rather smaller abdominal marginal spots. This, however, from a fair series I have examined both in the British Museum and my own collection, appears to be the normal form, and that described by Walker, represented by the type specimen only, is a slight variety.

THYREOCORINÆ.

Genus THYREOCORIS.

*Thyreocoris notatipennis.**Corimelæna notatipennis*, Stål, Rio Jan. Hem. i. p. 8 (1880).*Corimelæna chilocoroides*, Walk. Cat. Het. i. p. 79. n. 26 (1867).*Corimelæna terminalis*, Walk. loc. cit. p. 80. n. 29.*Thyreocoris Daldorfi.**Tetyra Daldorfi*, Fabr. Syst. Rhynch. p. 144 (1803).Var. *Corimelæna pictula*, Walk. Cat. Het. i. p. 80. n. 30 (1867).*Thyreocoris basalis.**Odontoscelis basalis*, Germ. Zeitschr. i. p. 41 (1839).*Corimelæna prorina*, Walk. Cat. Het. i. p. 80. n. 28 (1867).*Thyreocoris integrus.**Corimelæna integra*, Walk. Cat. Het. i. p. 80. n. 27 (1867).

Doubtfully distinct; may probably be one of Stål's species (cf. Rio Jan. Hem.), of which I have not seen typical specimens.

*Thyreocoris invariis.**Corimelæna invaria*, Walk. Cat. Het. i. p. 81. n. 31 (1867).

The same observation applies to this as to the preceding species (*supra*).

Genus CURSULA.

Cursula, Walk. Cat. Het. i. p. 81 (1867).

Cursula is allied to *Chlænocoris* and represents that genus with a laterally compressed body. I formerly described three species as compressed examples of *Chlænocoris*, which must either now be placed in *Cursula*, or that genus sunk as a synonym of *Chlænocoris*. The first course is followed.

*Cursula dissimilis.**Chlænocoris dissimilis*, Dist. Biol. Centr.-Am., Rhynch. Het. i. p. 310. n. 2, pl. xxx. f. 3 (1889).*Cursula compressa.**Chlænocoris compressus*, Dist. Biol. Centr.-Am., Rhynch. Het. i. p. 310. n. 3, pl. xxx. f. 11 (1889).*Cursula arctata.**Chlænocoris arctatus*, Dist. Biol. Centr.-Am., Rhynch. Het. i. p. 454. n. 4 (1893).

CYDNINÆ.

Genus STIBAROPUS.

Stibaropus molginus.

Scaptocorus molyinus, Schiodte, Kroyer's Nat. Tidskr. (2) ii. p. 481 (1849)

Stibaropus brunneus, Dall. List Hem. i. p. 125, t. iii. f. 1 (1851).

Stibaropus latipes, Atkins. (nec Westw.) J. Asiat. Soc. Beng. vol. lvi. pt. 2, p. 39 n. 27 (1888).

Stibaropus molginus, Atkins. loc. cit. p. 39. n. 28.

Confusion has arisen with this species, owing apparently to the description of the second joint of the antennæ "longer by half than the third." The second joint is, however, very small, as described by Dallas—one of the generic characters. I have Atkinson's specimens before me, which he identified as *S. molginus*, and in these the antennæ agree in structure with Dallas's description and type. Signoret further complicated matters by placing the *S. brunneus*, Dall., as a synonym of the species described by Westwood as *Cydnus latipes*, which, however, does not belong to *Stibaropus* but to the genus *Scoparipes*.

Stibaropus minor.

Stibaropus minor, Walk. Cat. Het. i. p. 166. n. 2 (1867).

Stibaropus testaceus, Walk. loc. cit. p. 166. n. 3.

Stibaropus flavidus, Sign. Ann. Soc. Ent. Fr. sér. 6, t. i. p. 47, pl. ii. f. 6 (1851).

Most probably also one of Schiödte's species, *S. tabulatus* or *S. callidus*, but impossible to determine from the description alone of those species.

Genus ADRISA.

Adrisa ? binotata.

Acatalectus binotatus, Walk. Cat. Het. i. p. 165. n. 8 (1867).

This species is alone represented by the type specimen, which possesses neither head nor thorax. As it was also unlocalized, the species (?) should be considered as non-existent.

Adrisa ? clara.

Acatalectus clarus, Walk. Cat. Het. iii. p. 535 (1868).

This species is not represented in the National Collection, the type specimen being recorded as in the National Museum, Melbourne.

Genus CYRTOMENUS.

Cyrtomenus marginalis.

Cyrtomenus marginalis, Sign. Ann. Soc. Ent. Fr. sér. 6, t. i. p. 201. n. 5, pl. vi. f. 21 (1881).

Æthus ciliatus, Dall. (nec Pal. Beauv.) List Hem. i. p. 117. n. 13 (1851).

Dallas's specimen is from Colombia; Signoret's type specimen was unlocalized.

Genus LACTISTES.

Lactistes rastellus.

Lactistes rastellus, Schiödte, in Kröy. Nat. Tidsskr. (2) p. 457 (1849).

Æthus philippinensis, Dall. List Hem. i. p. 118. n. 19 (1851).

Genus SCOPARIPES.

Scoparipes latipes.

Cydna latipes, Westw. in Hope Cat. i. p. 18 (1837).

Æthus stygius, Walk. Cat. Het. i. p. 161. n. 80 (1837).

Stibaropus latipes, Sign. Ann. Soc. Ent. Fr. sér. 6, t. i. (1881), nec figure; Leth. & Sev. Cat. Gén. Hémi. i. p. 61 (1893).

Scoparipes latipes, Sign. loc. cit. p. 203, pl. vi. fig. 22.

Signoret fell into an unfortunate tangle with this species. He saw Westwood's type, and co-types in my own collection. The first he returned labelled *Stibaropus latipes*, the second *Scoparipes latipes*. He evidently published from his MS. notes afterwards, confusing the genera and treating the same species in a duplex manner. The co-types of his *Scoparipes latipes* are in my own collection, and these have been again compared with Westwood's type.

Scoparipes insignis.

Æthus insignis, Walk. Cat. Het. i. p. 160. n. 79 (1837).

Cyrtomenus insignis, Vollenh. Faun. Ind. Neerl. p. 16, pl. ii. fig. 7 (1868).

Both authors described this species under the same specific name.

Genus ECTINOPUS.

Ectinopus rugoscutum.

Ectinopus rugoscutum, Sign. Ann. Soc. Ent. Fr. sér. 6, t. i. p. 319, pl. x. fig. 41 (1881).

Æthus nigerrimus, Walk. (part.) Cat. Het. i. p. 152. n. 25, spec. c, d, Ega (1837).

Genus PLONISA.

Plonisa plagiata.

Plonisa plagiata, Sign. Ann. Soc. Ent. Fr. sér. 6, t. i. p. 327, pl. xi.
fig 52 (1881)

Æthus brunneipennis, Dall. (nec Fabr.) List Hem. i. p. 113. n. 8 (1851).

KATAKADIA, gen. nov.

Pronotum with a very deep angulated cavity for the insertion of the head. Head very broad at anterior margin, where it is centrally slightly sinuate; the lateral lobes longer than the central, angularly narrowed posteriorly, being longest behind the eyes. Other characters generally as in *Cydnus*.

This genus is founded for the reception of *Æthus caliginosus*, Walk., and the very peculiar structure of the head and pronotum will sufficiently distinguish it.

Katakadia caliginosa.

Æthus caliginosus, Walk. Cat. Het. i. p. 161. n. 81 (1867).

Hab. Malacca (Brit. Mus.) ; Perak (*Doherty, coll. Dist.*).

Genus CYDNUS.

Cydnus rudis.

Æthus rudis, Walk. Cat. Het. i. p. 157. n. 57 (1867).

Æthus proximus, Sign. Ann. Soc. Ent. Fr. sér. 6, t. ii. p. 27. n. 18 (1882).

Walker in his description made no mention of the reddish-brown hue of the corium in his type specimen from the Gambia. Other specimens from Sierra Leone are in the British Museum. There seems little doubt that both the above descriptions refer to one species.

Cydnus insularis.

Cydnus insularis, Westw. in Hope Cat. i. p. 19 (1887).

Æthus rubrifemur, Walk. Cat. Het. i. p. 153. n. 34 (1867).

Cydnus varians.

Cydnus varians, Fabr. Syst. Rhyng. p. 187 (1803).

Æthus discolor, Walk. Cat. Het. i. p. 161. n. 82 (1867).

Cydnus lepidus.

Æthus lepidus, Stål, Cefv. Vet.-Ak. Förh. 1853, p. 215. 6; Hem. Afr. i. p. 21 (1864).

Æthus leucostigma, Dall. (Germ. Rev. Silb. v.) List Hem. i. p. 119 (1851).

The name quoted by Dallas appears to be a MS. one only, as I can find no trace of such a species described by Germar.

Cydnus lautipennis.

Cydnus (*Æthus*) *lautipennis*, Stål, (Efv. Vet.-Ak. Förh. 1858, p. 312. 6.
Æthus lividus, Walk. Cat. Het. i. p. 157. n. 58 (1867).

Cydnus indicus.

Cydnus indicus, Westw. in Hope Cat. i. p. 19 (1837).
Æthus fesus, Walk. Cat. Het. i. p. 163. n. 91 (1867).

Cydnus pilosus.

Cydnus pilosus, H.-Sch. Faun. Germ. cxvii. 22.
Æthus setosus, Walk. Cat. Het. i. p. 154. n. 39 (1867).

Genus CHÆROCYDNUS.

Chærocydnus, White, in Grey, 'Trav. in Australia, Appond. vol. ii.
 p. 472 (1841).

Chærocydnus foveolatus.

Chærocydnus foveolatus, White, *loc. cit.* fig. 6.

Dallas in recording this species (List Hem. i. p. 124, 1851) unfortunately gave as reference to White's description 'Zool. Voy. Ereb. & Terr.' instead of the Appendix to Grey's 'Travels,' as above. Signoret, finding no description or reference in the first-named publication, considered it an undescribed species and synonymic with Buchanan White's *C. albosignatus*, in which opinion he was followed by Lethierry and Severin in their catalogue. The two species, however, are quite distinct, and two specimens of *C. foveolatus* are in the British Museum.

Genus PANGÆUS.

Pangæus piceatus.

Pangæus piceatus, Stål, Stett. ent. Zeit. xxiii. p. 96 (1862).
Æthus tenuis, Walk. Cat. Het. i. p. 161. n. 22 (1867).
Æthus parilis, Walk. *loc. cit.* p. 153. n. 35.

Pangæus docilis.

Æthus docilis, Walk. Cat. Het. i. p. 154. n. 37 (1867).
Pangæus Dallasi (part.), Leth. & Sev. Cat. Gén. Hémi. i. p. 69 (1893).

This species is represented by the type specimen alone, which is carded and not in the best condition, the pronotum being somewhat injured. Signoret opined that this might prove to be his species *P. Dallasi*, but it seems distinct from Signoret's figure and description, in having the central transverse furrow to the pronotum somewhat obliterated at its middle.

*Pangæus margo.**Æthus margo*, Dall. List Hem. i. p. 116. n. 12 (1851).*Æthus scitus*, Walk. Cat. Het. iii. p. 535 (1868).

Genus MACROSCYTUS.

*Macroscytus transversus.**Cydnius transversus*, Burm. Nov. Act. Acad. Loop.-Car. 1824, p. 291, t. iv. fig. 4.*Acatalectus transversus*, Walk. Cat. Het. i. p. 164. n. 2 (1867).*Æthus transversus*, Walk. loc. cit. p. 158. n. 62.*Adria transversa*, Leth. & Sev. Cat. Gén. Hémi. p. 63 (1893).*Macroscytus transversus*, Leth. & Sev. loc. cit. p. 71.

Walker had apparently rightly identified this species, and then redescribed it as a new one. He probably placed it in the genus *Acatalectus* owing to one of the specimens having the last joint of the antennæ mutilated.

*Macroscytus badius.**Æthus badius*, Walk. Cat. Het. i. p. 159. n. 73 (1867).

Signoret in his Monograph of the Cydninae treated this species as a synonym of *M. brunneus*, Fabr., a course followed by Lethierry and Severin in their catalogue. I think for the present they should be kept distinct, till more material is examined.

*Macroscytus subcaneus.**Æthus subcaneus*, Dall. List Hem. i. p. 116. n. 11 (1851).*Cydnius subcaneus*, Leth. & Sev. Cat. Gén. Hémi. t. i. p. 68 (1893).*Macroscytus javanus*, Mayr, Verh. zool.-bot. Ges. Wien, 1866, p. 36; Leth. & Sev. loc. cit. p. 71.*Æthus equalis*, Walk. Cat. Het. i. p. 159. n. 72 (1867).*Æthus indicus*, Vollenh. Faun. Ind. Neerl. p. 17 (1868).*Macroscytus japonensis*, Scott, Ann. Mag. Nat. Hist. ser. 4, vol. xiv. p. 294 (1874).

Genus GEOTOMUS.

*Geotomus pygmaeus.**Æthus pygmaeus*, Dall. List Hem. i. p. 120. n. 25 (1851).*Æthus nanulus*, Walk. Cat. Het. i. p. 162. n. 83 (1867).*Æthus platysomoides*, Walk. loc. cit. p. 163. n. 92.*Æthus omicron*, Walk. loc. cit. iii. p. 534 (1868).*Geotomus apicalis.**Æthus apicalis*, Dall. List Hem. i. p. 120 (1851).

A much more elongated species than *G. pygmaeus*.

Geotomus subglaber.

Æthus subglaber, Walk. Cat. Het. i. p. 150. n. 17 (1867).

As this species is not included in Uhler's Check-list of described Hemiptera-Heteroptera of North America, published in 1886, some other named form is probably conspecific with it. In the absence of material for comparison, the synonymic question must be passed by, at least for the present.

Genus HIVERUS.

Hiverus ochraceus, sp. n.

Brownish ochraceous; membrane creamy hyaline. Antennæ with the first and second joints ochraceous, remaining joints pale piceous.

Broad, ovate; pronotum and scutellum sparingly punctate, corium more thickly punctate; scutellum broad, its apex broadly and subacutely rounded.

Long. $4\frac{1}{2}$ to 5 millim.

Hab. Tasmania; Hobart. (Three carded specimens—British Museum.)

Differing from *H. æneus*, Sign., the only specimen described from Australia, by its smaller size, different colour, and by the rounded and non-acuminate apex of the scutellum.

Genus CHILOCORIS.

Chilocoris semialbidus.

Æthus semialbidus, Walk. Cat. Het. i. p. 160. n. 74 (1867).

DRUPADIA, gen. nov.

Allied to *Chilocoris*, Mayr, but differing by the scutellum, which is broader, less angulated posteriorly, its apex broader and subacutely angulated. Corium a little shorter than the membrane. The body is also relatively shorter and broader.

Drupadia typica, sp. n.

Head, pronotum, scutellum, and body beneath dark chocolate-brown. Corium very pale stramineous, with scattered coarse darker punctures, and with a curved chocolate linear streak on disk; membrane pale greyish hyaline; antennæ

and legs reddish brown. Pronotum and scutellum somewhat thickly and coarsely punctate.

Long. 3 millim.

Hab. Bengal, Lohar-daga (*Atkinson Collection*).

Six carded specimens are contained in the British Museum.

Genus *BLÆNA*.

Blæna, Walk. Cat. Het. iii. p. 537 (1808).

Macrhymenus, Sign. Ann. Soc. Ent. Fr. 1880, p. xvii; *loc. cit.* sér. 6, t. iii. p. 523 (1883).

Blæna setosa.

Blæna setosa, Walk. Cat. Het. iii. p. 538 (1808).

Macrhymenus membranaceus, Sign. Ann. Soc. Ent. Fr. sér. 6, t. iii. p. 523, pl. xv. f. 204 (1883).

Genus *GARSAURIA*.

Garsauria, Walk. Cat. Het. iii. p. 536 (1808).

Microrrhynchus, Sign. Ann. Soc. Ent. Fr. sér. 6, t. ii. Bull. p. lxxiii (1882);

ibid. t. iii. p. 524 (1883).

Microrrhampus, Bergr. Rev. d'Entom. t. x. p. 214 (1801)

Garsauria aradoïdes.

Garsauria aradoïdes, Walk. Cat. Het. iii. p. 536 (1808).

Microrrhynchus Beccarii, Sign. Ann. Soc. Ent. Fr. sér. 6, t. iii. p. 525, t. xv. f. 205 (1883).

Genus *GNATHOCONUS*.

Gnathoconus quadrilineus.

Schirus quadrilinea, Walk. Cat. Het. i. p. 160. n. 22 (1807).

Genus *SEHIRUS*.

Schirus æneus.

Schirus æneus, Walk. Cat. Het. i. p. 160. n. 18 (1807).

The typical specimen from which this species was described is no longer to be found, at least in its place, in the British Museum. A second specimen, also collected by Mr. Wollaston at Madeira, is, however, available and agrees with the description. I have hitherto proposed, and still urge, that where the types of Walker's species are not to be found, such species should be treated as non-existent, for, with few exceptions, Walker's descriptions of Heteroptera are not only

most insufficient, but also have been proved to be frequently taken from solitary mutilated specimens. In the above instance, however, no doubt can exist.

Mentisa smaragdina, gen. & sp. n., Walk. Cat. Het. iii. p. 537 (1868).

Does not belong to the Cydninae at all.

Summarized Disposition of Walker's Genera and Species.

Plataspinae, Thyreocorinae, and Cydninae.

Genera considered valid.

- Cursula*, Walk. Cat. Het. i. p. 81 (1867).
- Cenina*, Walk. loc. cit. p. 82.
- Tetrisia*, Walk. loc. cit. p. 111.
- Garsauria*, Walk. loc. cit. iii. p. 536 (1868).
- Blæna*, Walk. loc. cit. p. 537.

Species considered valid and described under correct Genera.

- Cursula globifera*, Walk. Cat. Het. i. p. 81. n. 1 (1867).
- Cenina variolosa*, Walk. loc. cit. p. 82. n. 1.
- Coptosoma integra*, Walk. loc. cit. p. 88. n. 38.
- *lobata*, Walk. loc. cit. p. 88. n. 37.
- *transversa*, Walk. loc. cit. p. 88. n. 38 (nom. præocc. = *Walkeri*, Loth. & Sev.).
- *brevis*, Walk. loc. cit. p. 89. n. 40.
- *centralis*, Walk. loc. cit. p. 90. n. 44.
- *biplagiata*, Walk. loc. cit. p. 90. n. 45.
- *humeralis*, Walk. loc. cit. p. 90. n. 46.
- *testacea*, Walk. loc. cit. p. 91. n. 48.
- *marginata*, Walk. loc. cit. p. 92. n. 49.
- *plagiata*, Walk. loc. cit. p. 92. n. 50.
- *ramosa*, Walk. loc. cit. p. 93. n. 51.
- *amana*, Walk. loc. cit. p. 93. n. 52.
- *fractifascia*, Walk. loc. cit. p. 93. n. 53.
- *proxima*, Walk. loc. cit. p. 94. n. 55.
- *hæmorrhœa*, Walk. loc. cit. p. 96. n. 59.
- *consobrina*, Walk. loc. cit. p. 96. n. 60.
- *arvica*, Walk. loc. cit. p. 97. n. 62.
- *aspera*, Walk. loc. cit. p. 97. n. 63.
- *suberuciata*, Walk. loc. cit. iii. p. 523 (1868).
- *strenua*, Walk. loc. cit. p. 523.
- *cyathigera*, Walk. loc. cit. p. 524.
- *quadriplagiata*, Walk. loc. cit. p. 524.
- *gutticincta*, Walk. loc. cit. p. 525.
- *apicifera*, Walk. loc. cit. p. 526.
- Brachyplatys picturifrons*, Walk. loc. cit. i. p. 103. n. 25 (1867).
- *translineata*, Walk. loc. cit. p. 105. n. 28.
- Plataspis galerucoides*, Walk. loc. cit. p. 109. n. 8.

- Tetrisia bruchoides*, Walk. loc. cit. p. 112. n. 1.
Stibaropus minor, Walk. loc. cit. p. 166. n. 2.
Sehirus aneus, Walk. loc. cit. p. 169. n. 18.
Garsauria aradoides, Walk. loc. cit. iii. p. 530 (1868).
Rlena setosa, Walk. loc. cit. p. 538.

Species considered valid, but requiring generic revision.

- Corimelæna integra*, Walk. Cat. Het. i. p. 80. n. 27 (1867), belongs to
 gen. *Thyreocoris*.
 — *invaria*, Walk. loc. cit. p. 81. n. 31, belongs to gen. *Thyreocoris*.
Coptosoma basistigma, Walk. loc. cit. p. 98. n. 67, „ *Tiarocoris*.
Brachyplatys histeroides, Walk. loc. cit. p. 107. n. 34, belongs to gen.
Spathocrates.
Æthus subglaber, Walk. loc. cit. p. 150. n. 17, belongs to gen. *Geotomus*.
 — *fortis*, Walk. loc. cit. p. 151. n. 21, „ *Pangæus*.
 — *nitidulus*, Walk. loc. cit. p. 154. n. 36, „ *Cydnus*.
 — *docilis*, Walk. loc. cit. p. 154. n. 37, „ *Pangæus*.
 — *rudis*, Walk. loc. cit. p. 157. n. 57, „ *Cydnus*.
 — *badius*, Walk. loc. cit. p. 159. n. 73, „ *Macroscytus*.
 — *semialbidus*, Walk. loc. cit. p. 160. n. 74, „ *Chilocoris*.
 — *insignis*, Walk. loc. cit. p. 160. n. 79, „ *Scopariæpes*.
 — *caliginosus*, Walk. loc. cit. p. 161. n. 81, „ *Kalakadia*,
 [gen. nov.
Sehirus quadrilinea, Walk. loc. cit. p. 169. n. 22, „ *Gnathoconus*.

Species treated as synonymic.

- Corimelæna chilocoroides*, Walk. Cat. Het. i. p. 70. n. 26 (1867), = *Thyreocoris notatipennis*, Stål.
 — *proxima*, Walk. loc. cit. p. 80. n. 28, = *Thyreocoris basalis*, Germ.
 — *terminalis*, Walk. loc. cit. p. 80. n. 29, = *Thyreocoris notatipennis*, Stål.
 — *pictula*, Walk. loc. cit. p. 80. n. 30, = *Thyreocoris Daldorfi*, Fabr., var.
Coptosoma hilaris, Walk. loc. cit. p. 85. n. 18, = *Coptosoma transversa*, Westw.
 — *repleta*, Walk. loc. cit. p. 85. n. 19, = *Coptosoma nubila*, Germ.
 — *partita*, Walk. loc. cit. p. 85. n. 20, = *Coptosoma transversa*, Westw.
 — *scitula*, Walk. loc. cit. p. 86. n. 21, = *Coptosoma bipustulata*, Germ.
 — *anthochlora*, Walk. loc. cit. p. 87. n. 35, = *Coptosoma cribraria*, Fabr.
 — *siamica*, Walk. loc. cit. p. 89. n. 30, = *Coptosoma sphaerula*, Germ.
 — *orbicula*, Walk. loc. cit. p. 91. n. 47, = „ „
 — *concinnulla*, Walk. loc. cit. p. 94. n. 54, = „ „
 — *bellula*, Walk. loc. cit. p. 94. n. 50, = „ „
 — *inclusa*, Walk. loc. cit. p. 95. n. 57, = „ „
 — *arenaria*, Walk. loc. cit. p. 95. n. 58, = *Coptosoma forsteri*, Vollenh.
 — *blandula*, Walk. loc. cit. p. 96. n. 61, = *Coptosoma sphaerula*, Germ.
 — *polyspila*, Walk. loc. cit. iii. p. 524 (1868), = *Coptosoma proxima*, Walk.
 — *microstigma*, Walk. loc. cit. p. 525, = *Coptosoma sphaerula*, Germ.
 — *erythrospila*, Walk. loc. cit. p. 526, = *Coptosoma apicifera*, Walk.
Brachyplatys calabarica, Walk. loc. cit. i. p. 80. n. 4 (1867), = *Brachyplatys pallipes*, Fabr.
 — *negunica*, Walk. loc. cit. p. 90. n. 5, = *Brachyplatys pallipes*, Fabr.

- Brachyplatys bistriga*, Walk. loc. cit. p. 100. n. 12, = *Brachyplatys subænea*, Westw.
 — *cambodica*, Walk. loc. cit. p. 101. n. 13, = *Brachyplatys subænea*, Westw.
 — *cognata*, Walk. loc. cit. p. 101. n. 14, = " "
 — *adjuncta*, Walk. loc. cit. p. 101. n. 15, = " "
 — *liturifrons*, Walk. loc. cit. p. 102. n. 22, = *Brachyplatys silphoides*, Fabr.
 — *quinque-punctata*, Walk. loc. cit. p. 103. n. 23, = *Brachyplatys pauper*, Vollenh.
 — *contigua*, Walk. loc. cit. p. 103. n. 24, = *Brachyplatys subænea*, Westw.
 — *indotata*, Walk. loc. cit. p. 104. n. 26, = *Brachyplatys pullifrons*, Westw.
 — *continua*, Walk. loc. cit. p. 104. n. 27, = *Brachyplatys Fahlîi*, Fabr.
 — *paucifera*, Walk. loc. cit. p. 105. n. 29, = *Brachyplatys deplanatus*, Ech.
 — *ruptilinea*, Walk. loc. cit. p. 105. n. 30, = *Brachyplatys papuus*, Guér.
 — *intacta*, Walk. loc. cit. p. 106. n. 32, = *Brachyplatys pacificus*, Dall.
 — *frontalis*, Walk. loc. cit. p. 106. n. 33, = *Brachyplatys Fahlîi*, Fabr.
 — *cupreata*, Walk. loc. cit. p. 107. n. 37, = *Brachyplatys pacificus*, Dall.
Cyrtomenus crassus, Walk. loc. cit. p. 147. n. 4, = *Cyrtomenus castaneus*, A. & S.
Æthius fusiformis, Walk. loc. cit. p. 150. n. 20, = *Ectoprus holomelas*, Burm.
 — *tenuis*, Walk. loc. cit. p. 151. n. 22, = *Pangæus piccatus*, Stål.
 — *rubrifemur*, Walk. loc. cit. p. 153. n. 34, = *Cydnus insularis*, Westw.
 — *parilis*, Walk. loc. cit. p. 153. n. 35, = *Pangæus piccatus*, Stål.
 — *setosus*, Walk. loc. cit. p. 154. n. 39, = *Cydnus pilosus*, H.-Sch.
 — *lividus*, Walk. loc. cit. p. 157. n. 58, = *Cydnus lautipennis*, Stål.
 — *nigroæneus*, Walk. loc. cit. p. 158. n. 71, = *Cydnus ceylonicus*, Mayr.
 — *cæqualis*, Walk. loc. cit. p. 159. n. 72, = *Macrocytus subæneus*, Dall.
 — *stygius*, Walk. loc. cit. p. 161. n. 80, = *Scoparipis latipes*, Westw.
 — *discolor*, Walk. loc. cit. p. 161. n. 82, = *Cydnus varians*, Fabr.
 — *nanulus*, Walk. loc. cit. p. 162. n. 83, = *Geotomus pygmaeus*, Dall.
 — *ferus*, Walk. loc. cit. p. 163. n. 91, = *Cydnus indicus*, Westw.
 — *platysomoides*, Walk. loc. cit. p. 163. n. 92, = *Geotomus pygmaeus*, Dall.
 — *omicron*, Walk. loc. cit. iii. p. 534 (1868), = " "
 — *scitus*, Walk. loc. cit. p. 535, = *Pangæus margo*, Dall.
Acatalectus transversus, Walk. loc. cit. i. p. 164. n. 2 (1867), = *Macrocytus transversus*, Burm.
Stibaropus testaceus, Walk. loc. cit. p. 166. n. 3, = *Stibaropus minor*, Walk.

Treated as non-existent.

Types mutilated.

- Brachyplatys interrupta*, Walk. Cat. Het. i. p. 106. n. 31 (1867).
Acatalectus binotatus, Walk. loc. cit. p. 165. n. 8.

Species the types of which are supposed to be in Australia.

- Coptosoma simplex*, Walk. Cat. Het. i. p. 98. n. 96 (1867). National Museum, Melbourne.
Brachyplatys media, Walk. loc. cit. iii. p. 527 (1868). National Museum, Melbourne.
Acatalectus clarus, Walk. loc. cit. p. 535. National Museum, Melbourne.

XXI.—*Descriptions of Two new Homalopteroid Fishes from Borneo.* By G. A. BOULENGER, F.R.S.*Homaloptera microstoma.*

Head much depressed, one fourth longer than broad, its length one fifth of the total. Snout with obtuse margin; mouth very small, its width barely one fourth that of the head; barbels very short, on the lower surface of the snout, near the mouth; lips not fringed; eye in the posterior half of the head, $\frac{1}{8}$ length of head, $\frac{2}{3}$ interorbital width. Dorsal 10, commencing slightly in advance of first ventral ray, situated at equal distance from the end of the snout and the root of the caudal. Anal 7. Pectoral moderately large, terminating at a considerable distance from the ventral. Caudal once and a half as long as head, with deep crescentic notch, lower rays longest. Caudal peduncle nearly twice as long as deep. Scales extremely small, smooth; lat. l. 80. Uniform pale brown above, yellowish beneath.

Total length 79 millim.

A single specimen from the Akar River, Sarawak, collected by Mr. C. Hose.

Glaniopsis, gen. nov.

Head and anterior part of body depressed; snout scarcely projecting beyond the mouth, which is moderately large; five pairs of barbels—two in front of the snout, two at the angle of the mouth, and one between the two nasal openings; gill-openings narrow. Body covered with small scales, head naked; lateral line present. Dorsal fin short, further back than base of ventrals; anal short; pectoral and ventral fins horizontal, many-rayed, the outer rays simple.

Well distinguished from *Homaloptera* by the presence of a nasal barbel.

Glaniopsis Hanitschi.

Depth of body $6\frac{1}{2}$ times in total length, length of head 5 to $5\frac{1}{2}$ times. Head scarcely longer than broad, snout rounded; eye in the middle of the length of the head, its diameter 5 times in length of head, $2\frac{1}{2}$ in interorbital width; barbels subequal in length, twice as long as diameter of eye. Dorsal 8, commencing a little behind base of ventrals, situated at equal distance from the end of the snout and the end of the caudal. Anal 7. Pectoral as long as head, terminating at a considerable distance from the ventral. Caudal as long as head,

scarcely emarginate. Caudal peduncle as long as deep. Scales extremely small, smooth; lat. l. 120-125. Yellowish brown above, with transverse dark brown spots or interrupted cross-bands; head dark olive-brown above; lower parts whitish; dorsal and caudal greyish, the latter blackish at the base; pectorals greyish olive above, white beneath; ventrals and anal white; a black spot at base of ventral.

Total length 93 millim.

Specimens were collected by Dr. R. Hanitsch, of the Raffles Museum, Singapore, on Mount Kinabalu, in the Kadamaian River, at an altitude of 2100 feet.

A female contains ripe ova of large size, 2 millim. in diameter.

XXII.—*On the Occurrence of Gobius capito on the Coast of Brittany.* By G. A. BOULENGER, F.R.S.

LAST year in the Bay of Concarneau, and this year in the Gulf of St. Malo, my attention was attracted to a large Goby, growing to 10 inches, and most excellent eating, which appears to have been overlooked by all authors who have written on the fishes of the English Channel and the Bay of Biscay. This Goby I have ascertained to be *Gobius capito*, C. & V., a species believed to be restricted to the Mediterranean. The description given by most recent authors of the Gobies of the English Channel are so unsatisfactory, and denote so imperfect a knowledge on the part of the authors who have dealt with them, that it is highly probable the species will soon be added to the British fauna, as specimens may have been confounded with *G. paganellus* and *G. niger*, which latter species is stated by Day to attain to at least 9½ inches in length, although I strongly doubt its ever reaching much more than half that length. Mr. E. J. Allen kindly informs me that the largest Goby preserved in the Plymouth Laboratory is a *G. niger* 5 inches long.

In order to assist in the identification of this fish and to justify the correctness of my determination, I append the principal characters of a specimen obtained in August in rock-pools at St. Cast, Gulf of St. Malo.

Habit particularly stout and heavy; depth of body 5 times in total length, length of head 3½ times. Head a little broader than deep; snout 1½ diameter of eye, which is 5½ times in length of head and a little exceeds interorbital width; strongly enlarged outer teeth in the jaws; maxillary extending to below posterior third of eye; head scaly only on the

occipital and upper opercular regions. The distance between the eye and the dorsal equals the distance between the end of the snout and the preopercle. Dorsal VI, 15, the two portions very narrowly separated; the longest soft rays $\frac{1}{2}$ length of head, a little longer than the rays of the first fin, the base of which measures $\frac{1}{2}$ its distance from end of snout. Anal with 12 rays. Pectoral $\frac{1}{2}$ length of head, with silk-like upper rays. Ventral not reaching vent, with well-developed anterior flap forming an obtusely pointed process on each side. Caudal rounded. Caudal peduncle as long as deep. 61 scales in a longitudinal series, 22 between dorsal and anal. Greenish to blackish olive, more or less spotted and marbled with black; dorsal and caudal fins spotted with black; ventral whitish; yellowish white beneath.

Total length 19 centimetres.

Of the two British species with which this *Gobius* may have been confounded, *G. paganellus* and *G. niger* differ in the larger scales, there not being more than 17 between the dorsal and the anterior rays of the anal and 55 in a lateral series, and in the absence of the antero-lateral lobe of the ventral disk. Günther's statement (Cat. Fish. iii. p. 55) that the interorbital space is scaly in *G. capito* is erroneous; a specimen with 17 longitudinal series of scales between the dorsal and anal fins, put down by the same author as *G. capito* (spec. b), has only 55 scales in the lateral line, and is, in fact, a *G. paganellus*. Fine large specimens from the Bosphorus, received from Dr. Dickson since the publication of the British Museum Catalogue, have been carefully compared with the specimen described above, which affords the first evidence of the presence of *G. capito* in the English Channel.

XXIII.—On the Classification of Ciliate Infusoria.

By Dr. V. STERKI*.

AFTER so eminent a naturalist as Bütschli has modified Stein's system of Ciliata, it may appear rather assuming if I venture to propose some changes. It is done because my views have long been held, and have been confirmed as the years passed.

In the first place, it seems that the Peritricha are of an organization quite different from that of all other ciliates. The formation of the anterior part, peristome, mouth, &c., is

* From 'The American Naturalist,' vol. xxxii. no. 378, pp. 425-428.

unique, although having some resemblance to that of the *Stentorina*. There is no adoral zone with transverse rows of cilia like that in *Heterotricha* and *Hypotricha*, as has recently again been asserted by Delage et Herouard *. The arrangement of the muscular elements in the ectoplasm, or myonems, is quite different. The formation of a temporary posterior girdle of cilia for locomotion in the most typical *Peritricha*, and even the permanent one in some others, is a very distinguishing feature; and a distinction of highest order is their mode of fission in the longitudinal axis † or by gemination. This character has been explained in various ways, and some have tried to bring it in conformity with the transverse fission in the other groups. Nevertheless it remains different, and shows, combined with the other features noted above, that this group is of quite another type or phylum, the more so if we add the peculiar phenomena of conjugation. The remaining *Ciliata* differ from the *Peritricha* in regard to these characters, and they resemble one another in respect to the most significant of them.

In opposition to the *Peritricha* we may give to this second group the name *Pantotricha*. Among the latter those forms having a true adoral zone with a distinct beginning and end at the mouth-entrance, and bearing transverse rows of single cilia—that is, the *Hypotricha* and most of the *Heterotricha*—evidently are of a common type, and range in one group, which I propose to name *Zonotricha*. True, the extreme forms are very different, *e. g.* a *Stentor* on the one hand and a *Stylonychia* or *Euplotes* on the other; but it is well known that both series, by gradual changes, in fact, run together, and that there are forms which may be ranged with one or the other. Many *Peritricha* are quite depressed, while there are *Oxytrichidæ* nearly terete, showing little differentiation of the dorsal and ventral faces, with fine and densely set cilia over most of the body (*Strongylidium*). And such forms as *Stichospira* ‡ make the distinction still more illusory. Tactile hairs (or “dorsal cilia”) are wanting in some of the *Oxytrichidæ*, as well as in *Euplotidæ* and *Aspidiscidæ*. Longitudinal differentiation in the ectoplasm of *Urostyla* &c. comes very near the myonems in *Peritricha*. With the *Zonotricha* range *Halteria*, probably also *Strombidium* and *Gyrocoris*.

* ‘Traité de Zoologie Concrète: I. La Cellule et les Protozoaires.’ Paris, 1890, p. 452.

† It must be noted, however, that in all groups the direction of the division is across that of the myonems.

‡ See the writer’s article, ‘The American Naturalist,’ vol. xxxi. no. 366, June 1897, pp. 535–541.

A rather aberrant group falling under the same head are the Ophryoscolecidae, with their retractile peristome.

After removing these forms the Oligotricha, *i. e.* mainly the Tintinnidina, make a more uniform small group, characterized by the circular uninterrupted zone bearing cilia of a different form and type, inside of which the mouth is situated.

The Gymnostomata have been made by Bütschli a group of highest order, equal in value with all the other groups combined. It has been shown above that in a number of essential features they differ from the Peritricha and are in harmony with the other Planotricha, and they are especially so with the Aspirotricha. Yet the formation of the mouth, together with some other characters, is so significant that it does not seem natural to reunite these two groups into the old order Holotrichida, as the French authors have done (*loc. cit.* p. 430, 452). In the great diversity of the formation of the body among the Gymnostomata we have an interesting analogue with an equally wide range among the Zonotricha.

The highest position must be assigned the Oxytrichidae and Euplotidae. Here the differentiation of the main feature of the ciliates, the cilia, reaches its maximum, not only morphologically, but also physiologically, combined with the highest development of intellectual faculties, as far as we dare speak of such. In all these points the Peritricha, which have often been placed at the head of the class, are inferior; and their inferiority is demonstrated also by the fact that at least half of them are epizoa, or commensals; a large number of animals of both categories live in colonies, either actually coherent or close together, modes of life which are not so much different as is commonly supposed.

The groups Peritricha *, Gymnostomata, Aspirotricha, Oligotricha, and Zonotricha seem to have the significance of orders of about equal standing with "orders" throughout the animal kingdom. Thus we would have the following table:—

Subclasses.	Superorders.	Orders.
{ Peritricha.	{ Gymnostomata.	Peritricha.
{ Pantotricha.		Gymnostomata.
		{ Aspirotricha.
	{ Trichostomata (em.).	{ Oligotricha (em.).
		{ Zonotricha.

The Ciliata are here regarded as a class. To this point a

* The Peritricha might probably be divided into two orders; but, since I have not seen *Licnophora* and *Kentrochona*, the question is left open here.

little digression may be excused. Why should not both Ciliata and Suctoria be treated as classes? Conceded that Bütschli is right in regarding the tentacles as mouths, and I believe so, that would not necessitate ranging them together. The possession of cilia by the Acinetina, in the early stages of development, has possibly been overestimated. How many features are shown in the earlier or larval stages of other and higher animals to disappear at a later period, *e. g.* cilia in Mollusca (velum) and Echinodermata? If an ameboid stage, or the development and disappearance of flagella, were accorded so much significance, how should we then, with good reasons, regard the Rhizopoda, Sporozoa, and Flagellata as so many classes? The close resemblance of the phenomena of conjugation in the Ciliata and Suctoria is certainly significant; but we have essentially identical ways of fecundation &c. of the ova in different main groups of Metazon. In their definite formations the Ciliata and Suctoria are as much different from each other, or much more so, than, for example, the classes of vertebrates and arthropods. The question seems to be rather one of logic: if the Suctoria in their definite stage are to be considered a degenerated type of Ciliata, they must be ranged under the same head as a subgroup; if not so, they may well rank as a class at the side of the Ciliata.

New Philadelphia, Ohio,
April 1898.

BIBLIOGRAPHICAL NOTICES.

A Natural History of the British Lepidoptera. A Textbook for Students and Collectors. By J. W. TUTT, F.E.S. Vol. I. Sonnenschein, January 1899. 8vo. Pp. vi, 560.

To the superficial mind it might appear that there was already a sufficiency of works on British Butterflies and Moths; and yet many of those which have recently appeared treat of the subject from an enlarged standpoint, and cannot be denounced as superfluous. Among these we have met with none, not even Mr. Barrett's, which approaches the work which Mr. Tutt has undertaken, for comprehensiveness and richness of detail. The amount of matter, too, which it contains is enormous, for it is so closely printed, and small type is so freely used, that every page probably contains on an average from two to four times the amount of matter which might reasonably be expected to occupy a page of similar dimensions.

The first part of the book may be regarded as introductory, and contains chapters on the origin of the Lepidoptera; the ovum, embryology, and parthenogenesis; external and internal structure

of larvæ; variation of imagines, protective coloration, and defensive structures of larvæ; and classification. The Phylogenetic Tree illustrating the last section is extremely complicated, and will be found worth study, as graphically illustrating the author's views on the relation of the various groups of Lepidoptera.

It is not possible to speak of this portion of the book in detail. British and foreign authors are freely quoted, but large portions are founded on the direct observations of the author himself, or cast into a form regulated by his extensive knowledge of the subject.

The second part of the volume contains the life-history of a portion of the "Sphingo-Micropterygid stirps," working from the more generalized to the more specialized super-families, according to the system selected by the author. Only four super-families are discussed in the first volume—the Micropterygides, the Nepticulidos, the Cochlididos (or Eucleidos), and the Anthrocerides—comprising about 100 species, giving an average of three or four pages to each species. In many cases, however, this limit is far exceeded, the notice of *Anthrocerus filipendulæ* alone filling twenty-five pages, under the various heads of synonymy, original description, imago, sexual dimorphism, variation (with notices of varieties from *a* to *z*), ovum, larva, variation of larva, cocoon, pupa, dehiscence, food-plants, parasites, habits and habitat, time of appearance, localities, and distribution.

One commendable practice of the author's is to reprint the original description, whether short or long. In the case of *A. filipendulæ*, a Linnean species, it happens to be barely two lines long; but in the case of some of the *Nepticulæ* it runs to nearly a page. The relationships between foreign and British genera and species are likewise freely discussed.

We have said enough to show the enormous compendium of information which Mr. Tutt has brought together from all sources, published and unpublished, making his book a regular cyclopædia on almost all subjects connected directly or indirectly with British Lepidoptera. We hope that the author may receive some little return for the unavoidable amount of weary drudgery (to say nothing of the time spent in really interesting work) that he must have devoted to his self-imposed task, in the grateful recognition of his labours by his fellow Entomologists.

All about Birds. By W. PERCIVAL WESTELL.
'Feathers' Publishing Co. 8vo.

THIS should have been entitled 'The Young Bird-lover's Scrap-book.' It is nothing whatever but a collection of cuttings, more or less closely relating to birds, of varying degrees of merit, culled from good, bad, or indifferent sources; these are put together in no sort of order, but appear just as taken haphazard from the author's lucky-bag.

Some of the statements reproduced in this *olla podrida* are rather startling. As one who knows experimentally rather more than the

author perhaps, but yet is not in a position absolutely to disprove his haphazard assertion, the reviewer would be inclined to believe that a humming-bird could recede from an object without turning, exactly as a humming-bird moth can.

If Mr. Westell had only taken the trouble to prepare an index to his scrap-album, it is possible that some of the quotations from Glatke, Kearson, Bidwell, &c. might have been selected by his readers; but when they have to wade through such stuff as the statement that "Mr. Philip Crawley !," of Croydon, has the largest private collection of birds' eggs, some frivolous nursery rhyme, or a jest from one of the penny comic papers, it is not unnatural that one who desires to learn something about birds should not be attracted thereby.

MISCELLANEOUS.

The Poisons given off by Parasitic Worms in Man and Animals.

By G. H. F. NUTTALL.

MANY of the symptoms affecting the human subject as well as animals who harbour parasitic worms have been attributed by certain authors to poisons which the latter develop within the body of their host. Peiper, of Greifswald, recently published an article in which he gathered together a good deal of evidence from scattered sources, evidence which very clearly proves that a number of worms do give off poisons.

In the case of the *Ascar*i (familiarily called round or man-worms), which are found in man, the pig, the cat, and horse, the evidence is very striking. There are a number of cases recorded where children who suffered from convulsions, loss of consciousness, great loss of flesh, anæmia, and other symptoms were promptly and permanently cured of all of these by the use of medicines ("anthelmintics," vulgarly called "worm-medicines"), which removed the parasites from the body. A number of authors have claimed that these parasites were simply injurious through their presence as foreign bodies within the intestine, as well as through their boring, their active movements, and their robbing their host of his proper share of the food he had eaten. That these worms contain some poisonous substance was claimed by Miram, who, whilst studying the *Ascaris megalocephala*, suffered twice from attacks of sneezing, swelling of the eyelids, and excessive secretion of tears, besides severe itching and swelling of the fingers which had been in contact with the worms. Von Linstow noted that when these worms were cut open they gave off a sharp peppery odour and caused tears to flow from his eyes. Inadvertently touching his eye with a finger which had been in contact with these worms, a very severe inflammation of the conjunctiva, with a condition known as chemosis, resulted. Raillet, Arthus, and Chanson had similar experiences. The latter

two observers, working with an ascaris from the horse, suffered in addition from pain in the throat and loss of voice. These experimenters found that 2 cubic centimetres of the fluid taken from the inside of these worms would kill a rabbit.

Kolbe, of Reinez, after having read Peiper's publication above referred to, reported a remarkable case of a child he had unsuccessfully treated with the regular worm-medicines. The boy had suffered for over a year from severe abdominal pains, frequent attacks of fainting, and convulsions. The doctor having been unsuccessful, a friend of the boy's mother—a baker by trade—suggested that he should rub up a dried round-worm with sugar, and make the boy take it. This "homœopathic" remedy had an immediate effect, two tangled masses of worms the size of a fist being given off by the patient, who made a prompt and complete recovery. Cobbold and Davaine have reported cases where various nervous symptoms have subsided on the removal of tapeworms. Marx saw an epilepsy of three years' standing cease on the removal of a *Tania solium*. It is curious that the eyes are so frequently affected in those suffering from tapeworms. It is quite possible that this is due to the effects of a poison circulating in the blood, the same having been absorbed from the intestine where the parasite is domiciled. In five out of fourteen cases of patients harbouring the tapeworm known as *Tania nana*, Grassi observed serious symptoms resembling those of epilepsy.

Another worm, the *Bothriocephalus*, may cause severe anæmia, which has variously been explained as due to a peculiar poison, to effects resulting from the death of the worm, or to the length of time that the individual has harboured the parasite. A blood-sucking worm, the *Anchylostoma*, which may occur in hundreds, and even thousands, in the intestine, was believed by Lussana to contain a poison, and not to injure its host simply through the loss of blood it entailed. Looss, of Cairo, also states his belief, in a recent publication, that these parasites contain a poison. Working with the larvæ of this worm last summer, he found that even after carefully washing them they caused dogs which had swallowed them to vomit, whereas the water in which the parasites had been washed had no effect on the dogs.

The *Tenia echinococcus*, a tapeworm which in one form of its parasitic life gives rise to the condition called "Hydatid cyst," also gives off a poison, for the fluid taken from the cyst has been shown to be toxic by Debove and Humphrey, who experimented on men and animals. This explains the severe symptoms, and even death, which may follow the puncture of a cyst by the surgeon or its spontaneous rupture. There is also reason to believe that the *Trichina* and other parasitic worms give off poisons. At any rate, we have a fruitful field of investigation open to research along these lines, and there may be a good deal in the home remedy of the baker worm-specialist!—*The American Naturalist*, March 1899, pp. 247-249.

THE ANNALS

AND

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[SEVENTH SERIES]

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XXIV.—*Natural History Notes from H.M. Indian Marine Survey Steamer 'Investigator,' Commander T. H. Heming, R.N.—Series III., No. 1. On Mollusca from the Bay of Bengal and the Arabian Sea.* By EDGAR A. SMITH.

THE present paper contains merely descriptions of some of the new species obtained by the 'Investigator' during the season 1897-98. It seems advisable to publish them now, as Dr. Alcock, Superintendent of the Indian Museum at Calcutta, wishes the types to be returned as soon as possible for the purpose of figuring them in the 'Illustrations of the Zoology of the 'Investigator'.'

The continuation of this paper will contain a complete list of all the Mollusca collected during the above-mentioned season, with descriptions of additional new species.

I regret to say that examples of only seventeen of the thirty-five species now described can be retained for the collection of the British Museum, as all unique specimens have to be returned to the Indian Museum.

The following stations are frequently quoted:—

Station 229.—Lat. $9^{\circ} 29' 34''$ N., long. $75^{\circ} 38'$ E.:
360 fath.; green mud.

Station 232.—Lat. $7^{\circ} 17' 30''$ N., long. $76^{\circ} 54'$ E.:
480 fath.; grey mud.

Station 233.—Lat. $13^{\circ} 17' 15''$ N., long. $93^{\circ} 10'$ E.:
185 fath.; sand.

1. *Pleurotoma optata*.

Testa fusiformis, albida, epidermide tenui grisea induta; spira turrita, acuminata; anfractus circiter 10, in medio concavi, infra tuberculati, et serie tuberculorum minorum infra suturam instructi, transversim plus minus obsolete striati, ultimus infra seriem tuberculorum distinctius transversim striatus, lineisque incrementi flexuosis tenuibus sculptus; apertura alba, longit. totius $\frac{1}{2}$ paulo minor; labrum tenue, ad angulum subprofunde sinuatum; columella rectiuscula; canalis obliquus, leviter recurvus.

Longit. 36 millim., diam. 10; apertura 15 longa, $4\frac{1}{2}$ lata.

Hab. Station 232, off South India, 430 fath.; and St. 229, off Travancore, in 360 fath.

Remarkable for the concave whorls and the row of tubercles just above the suture.

2. *Pleurotoma (Bathytoma) Oldhami*.

Testa breviter fusiformis, alba; spira acuto pyramidalis; anfractus circiter 10, sutura profunde canaliculata sejuncti, leviter concavi, infra suturam zona sublati sed margine inferiore crenulato cincti, supra suturam cingulo, tuberculis numerosis gracilibus ornato, instructi, circa medium lira tenui orenulata cincti, ultimus liris transversis confertis tenuibus granosis ornatus, superne convexiusculus, antice contractus; apertura elongata, longit. totius $\frac{1}{2}$ æquans; labrum tenue, in medio prominens, curvatum, paululum infra suturam medioeriter profunde sinuatum; columella leviter obliqua, inferne reflexa, incrassata, in medio plus minus prominens.

Longit. 43 millim., diam. 15; apertura 21 longa, 5 lata.

Hab. Station 229, off Travancore coast, in 360 fath.

A very beautiful and interesting species closely allied to *P. atractoides*, Watson. Only a good figure could convey an idea of the detailed sculpture. A conspicuous feature is the broad smoothish band with the deeply channelled suture above and a narrow deep furrow beneath it; also the more prominent tuberculated zone on the lower part of the whorls is very striking. The small tubercles on the transverse line of the body-whorl are incurved longitudinal rows, following the lines of growth.

Named after Commander C. F. Oldham, R.N., of the 'Investigator.'

3. *Pleurotoma (Surcula) breviplicata*.

Testa albida, gracilis, fusiformis; spira turrita, acuminata; an-

fractus 10, supremus subglobosus, lævis, cæteri in medio angulati, supra concavi, infra contracti, oblique plicati, plicis supra angulum haud productis, infra medium liris tenuibus transversis filiformibus ornati, supra linois incrementi tenuissimis curvatis sculpti, ultimus antice rostratus, oblique tenuiter latus; apertura cum canali longit. totius $\frac{1}{2}$ æquans; labrum tenue, in medio arcuatim prominens, prope suturam haud profunde sinuatum; columella lævis, subrecta; canalis parum obliquus, angustatus. Longit. 26 millim., diam. 8; apertura cum canali 13 longa, 3 lata.

Hab. Station 233, off Andaman Islands, in 185 fath.

The plicæ are delicate, oblique, about thirteen in number, and very short, commencing at the median angle and scarcely reaching the suture below.

4. *Pleurotoma (Surcula) eurina*.

Testa breviter fusiformis, alba, epidermide tenui sordide lutescente induta; anfractus normales 9-10, supra medium concavi, infra convexi, et nodose costati, undique spiraliter tenuiter striati, lineisque incrementi flexuosis sculpti, in anfr. ultimo costis leviter obliquis circiter 16 infra subito attenuatis et fere evanidis; apertura alba, longit. totius $\frac{3}{4}$ adæquans; columella rectiuscula, vix arcuata, alba, lævis; labrum tenue, superne late et profundo sinuatum; canalis anterior brevis, latus, obliquus. Longit. 44 millim., latit. 15; apertura 18 longa, 6 lata.

Hab. Station 232, off South India, in 430 fath.

The whorls are bordered below the suture with a thickened margin.

5. *Pleurotoma (Surcula) præcipua*.

Testa fusiformis, albida, spira acuminata; anfractus 9, superne oblique declives, infra oblique subdistanter plicati, et spiraliter tenuiter striati, lineisque incrementi flexuosis sculpti, ultimus lævis, convexus, haud plicatus; apertura longit. totius $\frac{1}{2}$ fere æquans; labrum tenue, prominens, curvatum, ad suturam medio-criter profunde sinuatum; columella obliqua, recta, callo tenui reflexo induta. Longit. 38 millim., diam. 15; apertura 18 longa, 6 lata.

Hab. Station 229, off Travancore coast, in 360 fath.

Remarkable for the smooth convex body-whorl, which contrasts with the plicate spire. Two dead specimens.

6. *Pleurotoma (Surcula) arcana*.

Testa fusiformis, sordide albida, epidermide tenui olivacea induta; spira acuminata, turrita; anfractus circiter 10, supra declives,

concaui, infra angulati, supra angulum tuberculati, tuberculis subacutis, in anfr. ult. circa 12, lineis incrementi tenuibus flexuosis striati, striis spiralibus exilibus sculpti, ultimus antice angustatus, rostratus, transversim striatus; apertura antice canaliculata, longit. totius $\frac{1}{2}$ haud æquans, columella paulo obliqua, alba, callosa, labrum tenue, superne late sed mediocriter profunde sinuatum, in medio arcuatim prominens
Longit 25 millim., diam 9, apertura cum canali $10\frac{1}{2}$ longa, $3\frac{1}{2}$ lata.

Hab. Station 233, off Andaman Islands, in 185 fath., and Station 229, off Travancore coast, in 360 fath.

The transverse striæ upon the upper concave portion of the whorls are finer and less conspicuous than those below the row of tubercles. Two specimens only.

7. *Drillia investigatoris*.

Testa fusiformis, rufo-fusca, zona pallida supra medium anfractuum cincta, longitudinaliter fortiter rotunde costata, undique spiraliter tenuiter lirata, anfractus 12, supremi duo (nucleus) læves, albi, globosi, cæteri supra prope suturam leviter concavi, dein obtuse subangulati, lateribus interne contractis, convexiusculis, ultimus elongatus, apertura angusta, longit. totius $\frac{1}{2}$ fere æquans, labrum prope suturam sinuatum, columella rectiuscula, obliqua.
Longit. 65 millim., diam. 20, apertura 31 longa, 7 lata.

Hab. Station 233, off Andaman Islands, in 185 fath.

The costæ do not extend beyond the middle of the body-whorl. One specimen obtained.

8. *Drillia captiva*

Testa breviter fusiformis, pallida, spira elongata, acuminata; anfractus circiter 10, supra concave excavati, infra vix convexiusculi vel subplani, infra sed ad suturam carinati, costis obliquis tenuibus circiter 14-16, lrisque spiralibus 3-4 nodose cancellati, costis in anfr. ultimo infra medium evanidis, lris transversis circa 16, inferioribus paucis haud nodulosis, apertura obliqua, irregularis, antice breviter canaliculata, longit. totius $\frac{1}{2}$ paulo superans, labrum extus varicosum, supra valde sinuatum; columella callo tenui superne subtuberculato induta
Longit 21 millim., diam $6\frac{1}{2}$; apertura $7\frac{1}{2}$ longa, $2\frac{1}{2}$ lata.

Hab. Station 233, off Andaman Islands, 185 fath.

In addition to the sculpture described above, very fine spiral striæ, crossed by equally fine lines of growth, are observable under a powerful lens. Attached to *Xenophora pallidula*.

9. *Drillia capta*.

Testa breviter fusiformis, sordide albida; spira turrata, acuminata;

anfractus 11 12, costis leviter obliquis circiter 12, paulo infra suturam sulco haud profundo bisectis, instructi, undique tenuiter spiraliter striati; apertura parva, longit. totius $\frac{1}{2}$ haud æquans; labrum tenue, prominens, arcuatum, supra profunde sinuatum; columella callo conspicuo soluto, ad suturam prominente et labro juncto induta; canalis anterior brevis, recurvus.

Longit. 19 millim., diam. 6; apertura 6 longa, 2 lata.

Hab. Station 233, off Andaman Islands, 185 fath.

This species is remarkable on account of the fine transverse striae which cover the entire surface, also for the prominent columellar callus and the deep rounded sinus of the labrum. The upper ends of the costae are cut off by a shallow groove or depression. Found attached to *Xenophora pallidula*.

10. *Trophon tenuirostratus*.

Testa fusiformis, albidæ; spira acuminata, turrita, anfractus circiter octo, infra medium angulati, supra declives, paulo concavi, longitudinaliter tenuiter plicati (plicis in anfr. ult. 12 13 inferne attenuatis), lineis incrementi tenuibus striati, ultimus liris tribus subobsoletis transversis cinctus, infra angulum convexus, antice tenuiter rostratus; apertura superne ovata, antice canaliculata; columella rectiuscula, callo tenui induta.

Longit. 28 millim., diam. $10\frac{1}{2}$; apertura cum canali 15 longa, $4\frac{1}{2}$ lata.

Hab. Station 233, off Andaman Islands, in 185 fath.

The plicae become slightly acutely nodose at the angulation, and the three feeble transverse ridges upon the body-whorl give it a faintly clathrate appearance. One example only.

11. *Trophon indicus*.

Testa late fusiformis, alba, epidermide tenui subolivacea induta; spira turrita, conica; anfractus 8?, supra declives, subconcavi, in medio angulati, plicis obliquis tenuibus (in anfr. penult. circiter 18) instructi, spiraliter tenuiter striati, ultimus amplus, plicis antice tenuioribus; apertura alba, longit. totius $\frac{1}{2}$ adæquans; labrum tenue, supra angulum late haud profunde sinuatum, infra arcuatum prominens; columella callo albo induta, leviter incurvata.

Longit. 35 millim., diam. 18; apertura 18 longa, 8 lata.

Hab. Station 233, off Andaman Islands, in 185 fath.

In addition to the plicae, the surface exhibits fine lines of growth. A single specimen only.

12. *Fusus captivus*.

Testa fusiformis, parva?, sordide albida, rufo lirata; anfractus 8, convexi, supremi duo læves, globosi, cæteri costis 10-11 tenuibus obliquis arcuatis instructi, liris transversis duobus circa medium cincti, lineisque spiralibus filiformibus paucis ornati, incrementi lineis striati, ultimus liris præcipuis circiter 12 succinctus; apertura alba, longit. totius $\frac{1}{2}$ æquans; labrum tenue, intus liris intransitibus 8-9 munitum; columella callo tenui induta, superne arenata; canalis anterior obliquus, subrecurvus, haud elongatus. Longit. $22\frac{1}{2}$ millim., diam. $8\frac{1}{2}$; apertura 11 longa, 3 lata.

Hab. Station 233, off Andaman Islands, 185 fath.

The fine thread-like spiral lines being crossed by rather distinct lines of growth, give to the surface a finely latticed appearance. Allied to *F. niponicus*, Smith.

13. *Nassaria lævior*.

Testa ovato-fusiformis, sordide albida; spira conica; anfractus 8, duo superiores læves, sequentes sutura canaliculata sejuncti, costis tenuibus obliquis lirisque spiralibus inæqualibus gracilibus tuberculatim cancellata, varicibus duobus magnis convexis instructi, in ultimo costis fere evanidis; apertura obliqua; canalis anticus obliquus, recurvus; labrum extra varicosum, intus liris intransitibus circiter 14 instructum; columella in medio arcuata, callo tenui induta, supra et infra transversim lirata, et supra marginem canalis tuberculis paucis parvis munita. Longit. 26 millim., diam. 16.

Hab. Station 237, lat. $13^{\circ} 17' N.$, long. $93^{\circ} 7' E.$, off Andaman Islands, 90 fath.

The large swollen varices, two upon each whorl, are very faintly tinted with rose. The longitudinal costæ, which are only feebly indicated upon the body-whorl, become more pronounced and fewer upon each whorl as they advance towards the apex. The transverse liræ are about eight in number upon the penultimate whorl, and the whole surface is marked with fine lines of growth.

Closely allied to *N. nivea*, Gmelin, *N. turrita*, Sow., and *N. multiplicata*, Sow., and chiefly distinguished by the smoother body-whorl and the swollen varices. All four forms might well be regarded as varieties of one and the same species.

14. *Tritonidea delicata*.

Testa fusiformi-ovata, epidermide plus minus setosa induta, rufescens, circa medium anfract. ultimi zona pallida cincta, longitudinaliter plicata et spiraliter tenuiter lirata; anfractus 9, convexi,

sutura profunda sejuncti, plicis arcuatis numerosis (in anfr. penult. circiter 18, in superioribus minus numerosis) instructi, liris spiralibus (in anfr. penult. circiter 7, lineis filiformibus intercalatis) supra plicas continuis ornati, ultimus pone labrum varice valido munitus; apertura alba, longit. totius $\frac{1}{2}$ adæquans, antice oblique canaliculata; labrum ad marginem tenue, intus tenuiter lirat, antice tuberculo conspicuo munitum; columella superne arcuata, callo albo, circumscripto, supra labro juncto, induta. Longit. 31 millim., diam. 17; apertura 16 longa, 8 lata.

Hab. Station 237, lat. $13^{\circ} 17' N.$, long. $93^{\circ} 7' E.$, off Andaman Islands, 90 fath.

15. *Pisania angusta*.

Testa angusta, rufo-fuscescens, circa medium anfr. ultimi albo cineta, lineis transversis paucis albo et rufo punctatis ornata; anfractus 8?, superiores longitudinaliter costati et spiraliter tenuiter lirati, convexusculi, tres ultimi laud costati, leviter convexi, striis transversis lineisque incrementi arcuatis sculpti; apertura angusta, ovalis; labrum extra incrassatum, intus album, lirat, ad marginem denticulatum; columella arcuata, callo valido albo induta, superne tuberculo gracili munita; canalis anterior brevis, obliquus, recurvus. Longit. 21 millim., diam. $8\frac{1}{2}$; apertura 9 longa, 4 lata.

Hab. Off south coast of Ceylon, 34 fath.

In form rather like *P. crenilabrum*, A. Adams.

16. *Nassa aracanensis*.

Testa minima, oblique costata, costis superne acute nodosis, alba, infra suturam inter tubercula et circa basin anfr. ultimi purpureo-fusco tincta, et circa medium fusco-picta; spira turrita, laud acuta; anfr. 7, superiores tres læves, nitidi, cæteri inter costas obliquas arcuatas transversim striati; apertura alba; labrum extra costa valida alba incrassatum, intus liris circiter 7 munitum; columella callo tuberculato induta. Longit. 7 millim., diam. 4; apertura $2\frac{1}{2}$ longa, $1\frac{1}{2}$ lata.

Hab. Reef Island, Kyuk Phyon, off Aracan coast.

The costæ are thirteen upon the body-whorl, which also has a few of the striæ around the lower part stronger than those above. The columellar callus exhibits about six or seven small tubercles, of which the uppermost is the largest.

17. *Nassa diluta*.

Testa ovata, superne acuminata, albida, epidermide tenuissima olivacea induta; anfractus 7, primus lævis, cæteri costis 11-12

longitudinalibus supra nodosis et paulo infra suturam constrictis, in medio angulatis instructi, inter costas læves, ultimus penultimo vix latior, costis versus labrum tenue sensim evanidis, tuberculis infra suturam solum manentibus, circa basin liris paucis instructus; apertura parva, longit. totius $\frac{1}{2}$ subæquans; columella infra rectiuscula, callo lævi tenui induta, antice callo spirali intrante instructa.

Longit. 12 millim., diam. 7; apertura 4 longa, 3 lata.

Hab. Off Colombo, 597 fath.; also off Kistna coast, 753 fath.

The name *diluta* has reference to the absence of colour-markings.

18. *Columbella (Mitrellu) supraplicata*.

Testa ovato-fusiformis, pallide roseo-fuscescens, nitida; anfractus normales 7?, leviter convexiusculi, superiores quatuor plicis arcuatis tenuibus obliquis instructi, inferiores 2-3 haud plicati, lincis incrementi tenuissimis striisque spiralibus tenuibus sculpti, ultimus antice oblique sulcatus; apertura angusta, concolor, longit. totius $\frac{1}{2}$ haud æquans; labrum arcuatum, extra inerasatum, intus liris brevibus albidis circiter duodecim armatum; columella obliqua, curvata, callo crassiusculo induta, intus tuberculis 2-3 munita; canalis anterior brevis, obliquus.

Longit. 13 millim., diam. 5; apertura 5 longa, 2 lata.

Hab. Station 232, off Travancore coast, in 430 fath.

A single specimen. This species in some respects resembles *C. Pacci**, but differs in its somewhat more robust form, in colour, the presence of longitudinal riblets or plicæ upon the upper volutions, the thicker ridge-like callus upon the columella, and the somewhat less pronounced labral varix. The spire is less tapering and the whorls are not so turreted and have not the upper edge margined by a spiral groove.

19. *Coralliophila indica*.

Testa breviter fusiformis, alba, costis longitudinalibus circiter decem et liris transversis squamosissimis (squamis supra costas productis) instructa; anfractus normales quatuor, supra medium angulati, superne oblique tubulati, infra leviter convexi, squamis supra costas ad angulum cæteris longioribus sursum erectis, ultimus infra medium contractus, antice breviter caudatus et rimatus; apertura piriformis, antice canaliculata, cum canali longit. totius $\frac{1}{2}$ paulo superans; columella rectiuscula, callo

* Ann. & Mag. Nat. Hist. 1895, vol. xvi. p. 5, pl. i. fig. 7.

tenui labro juncto induta; labrum intus leviter incrassatum et liratum; canalis anterior obliquus, recurvus.

Longit. 28 millim., diam. 14; apertura cum canali 17 longa, intus 7 lata.

Hab. Station 232, off South India, 430 fath.

In this very pretty species the transverse ridges are covered with close-set scales, those upon the longitudinal costæ being longer than the rest and giving to the ribs a filled appearance. The ridges are alternately large and slender, being about three in number above the angle and four below. Upon the body-whorl there is a broad ridge at the base, with very large scales, which forms the rimation. Only in adult examples is the labrum thickened and lirate within, the linæ being rather inconspicuous and eight or nine in number. Reeve's figure of *Murex squamulosus* (Con. Icon. iii. fig. 184) very closely represents this species; indeed the two forms are scarcely separable.

20. *Cancellaria cretacea*.

Testa ovata, vix rimata, oblique plicata et spiraliter confertim lirata, liris supra et inter plicas continuis, sordide albida, cretacea, anfractus circiter 5, convexi, sutura profunda sejuncti, celeriter accrescentes, ultimus magnus, plicis 13 obliquis mediocriter validis instructus; apertura albida, ovata, antice haud canaliculata, longit. totius $\frac{1}{2}$ superans; labrum mediocriter tenue, intus liris circiter decem intransitibus munitum; columella callo reflexo, superne labro juncto, induta, triplicata, suprema aliis paulo validiore.

Longit. 25 millim., diam. maj. 19; apertura 14 longa, 10 lata.

Hab. Station 229, off Travancore coast, in 360 fath.

Remarkable on account of the absence of an anterior canal and of colour.

21. *Ancilla leucospira*.

Testa angusta, cylindracea, superne acuminata, alba, circa medium anfractus ultimi zona lata pallide olivacea cincta; spira convexa conoidea, callo albo induta; anfractus 5, planiusculi, sutura vix conspicua sejuncti, primus corneus, convexus, ultimus elongatus, cylindricus, lineis incrementi tenuissimis sculptus, striisque transversis minute decussatus; apertura angusta, superne acuta, alba; columella callo tenui induta, inferne plicis 4-5 obliquis instructa; labrum intus paulo incrassatum, ad marginem acutum, superne subsinuatum.

Longit. 13 millim., diam. 5; apertura $6\frac{1}{2}$ longa, 2 lata.

Hab. Station 240, lat. $11^{\circ} 32'$ N., long. $92^{\circ} 46'$ E., off Andaman Islands, 194 fath.

The colour-band on the body-whorl upon close examination is seen to be longitudinally streaked.

22. *Ancilla glans*.

Testa gracilis, acuminato-ovata, grisea, supra callo rufo-fuscescente induta, circa basin rufescens; spira acuminata, ad apicem submamillata; anfractus 8, planiusculi, sutura callo plerumque obscurata sejuncti, ultimus elongatus, convexiusculus, longitudinaliter tenuiter striatus; apertura angusta, longit. totius $\frac{1}{2}$ adæquans; labrum tenue, antice ad basin leviter incrassatum, supra prope suturam haud profunde sinuatum; columella inferne alba, reflexa, crassa, oblique sulcata.

Longit. 34 millim., diam. 12; apertura 20 longa, 5 lata.

Hab. Station 233, off Andaman Islands, 185 fath.

A very distinct species on account of its slender form, recalling somewhat that of a narrow pointed acorn.

23. *Scalaria subcasta*.

Testa elongata, gracilis, alba, imperforata; anfractus normales decem convexi, sutura obliqua profunda sejuncti, lamellis numerosis tenuibus acutis reflexis, superne prope suturam productis vel subapinosis instructi, inter lamellas transversim tenuissime striati; apertura subcircularis; peristoma expansum, reflexum, antice haud profunde subsinuatum.

Longit. 22 millim., diam. 7; apertura intus 4 longa.

Hab. Station 232, off Travancore coast, 430 fath.

Closely related to *S. costa*, A. Adams, from Japan, but with more slowly increasing whorls, more numerous lamellæ, finer spiral striæ, &c. The lamellæ are closer together upon the upper than upon the last two whorls, numbering about twenty-four upon the former and sixteen upon the latter. One example.

24. *Scalaria bengalensis*.

Testa subulata, turrita, imperforata, alba; anfractus perconvexi, sensim accrescentes, sutura obliqua sejuncti, lamellis numerosis tenuissimis leviter obliquis et reflexis instructi, in interstitiis spiraliter striati; peristoma paulo incrassatum, expansum, et reflexum.

Longit. 30 millim., diam. 11; apertura intus 6 longa.

Hab. Station 229, off Travancore coast, in 360 fath.

From some broken fragments it is evident that this species attains larger dimensions than those here given of a specimen consisting of twelve whorls. It is rather less slender than *S. subcasta* and the lamellæ become more numerous instead of fewer as the shell increases. The spiral striæ are a little coarser in the present species.

25. *Astridium bathyrhaphe*.

Testa imperforata, turbinata, lilacea, seriebus granulorum ornata, ad suturam lato et profunde canaliculata; spira conica, ad apicem alba, obtusa, planata; anfractus 9, apicales quinque supra planulati, cæteri ad latera declives, plani, lineis incrementi tenuibus obliquis sculpti, supra ad suturam lato et profunde canaliculati, seriebus granulorum 4-5 (quarum suprema maxima, infima squamata) cincti, ultimus convexus, infra seriem squamatam ad peripheriam sitam, seriebus granulorum 9-10 pallidiorum ornatus, inter granula purpureo punctatus; apertura irregulariter rotundata, intus lineis intrantibus quasi sulcata; labrum leviter expansum; columella incrassata, callo expanso labro juncto induta.

Diam. maj. 34 millim., min. 29; alt. 33. Operculum rotunde ovatum, convexum, crassum, album, olivaceo tinctum, fere læve, concentricè obsolete sulcatum.

Hab. Station 218, N. Maldivé Atoll, in 210 fath.

This species, of which only a single specimen was obtained, is most remarkable on account of the deep broad canaliculation beneath the suture. The periphery, instead of being marked by a row of granules, is formed of a squamose keel which is spirally irregularly striated. It ascends the spire above the sutural furrow, and between it and the suture there is a series of very small white granules. Of the rows of granules upon the lower half of the body-whorl, the third from the periphery is a little larger than the first and second and much larger than those below. Both above and below this third row a few spiral elevated lines are noticeable. The aperture, although quite smooth within, has the appearance of being sulcated, the pseudo-sulci corresponding to the rows of granules.

26. *Turbo (Cantrainea?) incoloratus*.

Testa parva, turbinata, imperforata, alba; anfractus quinque, celeriter accrescentes, convexiusculi, superiores liris spiralibus 3-4 cincti, ultimus et penult. fere læves, supra prope suturam oblique nodose plicati, lineisquo incrementi obliquis striisque spiralibus subobsoletis sculpti; apertura leviter obliqua, subrotundata, albo-

margaritacea; labrum externum ad marginem acutum, intus incrassatum; columella incrassata, tuberculo obliquo instructa; operculum ignotum.

Longit. 10 millim., diam. maj. 10.

Hab. Station 232, off South India, in 430 fath.

To the naked eye this little species has an almost smooth appearance. Under the lens, however, the first two or three whorls are seen to be ornamented with three or four spiral rounded ridges, which gradually fade away on the penultimate whorl. The uppermost, however, is indicated upon this and the last volution by an infra-sutural row of oblique nodose plicæ, from which flow the oblique more or less raised lines of growth. Three out of the four specimens examined have the body-whorl rounded at the periphery, but in the fourth there is a slight angulation.

27. *Leptothyra delecta*.

Testa turbinata, imperforata, albida, roseo-tincta, spiraliter lirata, liris incrementi lineis sublamelliformibus obliquis subgranulatis; anfractus 6½. convexi, supra declives, ultimus antice leviter descendens, ad peripheriam rotundatus, infra paulo planatus, liris concentricis circiter 13, superioribus gracilioribus, instructus, in medio callosus, albus; apertura leviter obliqua, irregulariter circularis; columella incrassata, reflexa, obliqua, parum arcuata; labrum tenue.

Diam. maj. 13 millim., min. 11; alt. 14½.

Hab. Station 237, lat. 13° 17' N., long. 93° 7' E., off Andaman Islands, 90 fath.

The protoconch, consisting of a whorl and a half, is smooth and scarcely raised above the next volution, so that a rather obtuse apex is thus formed. The body-whorl has about twenty liræ, seven above the middle and the rest beneath, the penultimate and preceding whorl seven. The lines of growth are closer together and less lamellated upon the spire, and the liræ more granose than those upon the body-whorl. The ground-colour is whitish, and this is varied with oblique stripes of a rosy tint, this colour appearing only on the spiral liræ, and not in the interstices between them. Operculum unknown.

The species, allied to *L. amussitata*, Gould, from Japan, is larger, more elevated in the spire, of a different colour, and remarkable for the lamellated lines of growth.

28. *Solariella oxycona*.

Testa anguste umbilicata, elate conica, albida, submargaritacea;

spira acuminata, pagodiformis; anfractus 10, sensim accrescentes, duo superiores laeves, cæteri supra oblique declives, infra medium angulati, ad angulum tuberculis acutis numerosis parvis ornati, ultimus infra leviter convexus, liris quinque tenuibus tuberculatis instructus; sutura minute denticulata; apertura obliqua, subquadrata; peristoma tenue, margine columellari anguste reflexo. Diam. maj. 17 millim., min. 15; alt. 21.

Hab. Off Andaman Islands, in 490 fath.

The tubercles are somewhat scale-like or hollowed out on the anterior side, the third lra from the umbilicus exhibiting only a few anteriorly near the aperture. Belonging to the same group as *S. lissocoena*, Dall, and a few other species. One specimen only.

29. *Fissurella delicata*.

Testa ovata, conica, elata, tenuiuscula, sordide albida, costis tenuibus inæqualibus numerosis lirisque concentricis confertis supra costas nodulosis tenuiter cancellata; foramen apicale rotunde ovatum, paulo ante medium situm; pagina interna albida, ad marginem tenuiter crenulata.

Longit. 28 millim., diam. 18; alt. 13.

Hab. Station 232, off Travancore coast, 430 fath.

Allied to *F. densiclathrata*, Reeve, but more elevated, more delicately clathrate, with the apical foramen more central. Also thinner and without colour-rays.

30. *Puncturella (Cranopsis) indica*.

Testa pileiformis, ovata, alba, tenuis, costellis numerosis tenuibus inæqualibus, alternatim majoribus, lirisque concentricis supra costellas granosis concinne cancellata; apex valde recurvus, terminalis, sed margine longe remotus; margo basalis crenulatus, ad latera leviter arcuatim elatus; foramen elongatum, angustum, medianum.

Longit. 6 millim., diam. 4.5; alt. 4.

Hab. Station 232, off Travancore coast, 430 fath.

Scarcely separable from the Japanese *P. pelex*. It is, perhaps, a trifle broader, less produced above, has the apex curved over more terminally, the margin slightly arched at the sides, and the dorsal opening narrower.

31. *Tellina travancorica*.

Testa inæquilateralis, compressa, alba, lamellis concentricis tenuissimis confertis ornata, elongata, antice rotundata, postice subacuminata; margo dorsi anticus subdeclivis, posticus magis obliquus, subrectus, ventralis late curvatus; valvæ tenues, fero

æquales; umbones parvi, acuti, postmediani; dentes cardinales duo inæquales in utraque valva, laterales valvæ dextræ elongati, tenues, posterior antico remotior; pagina interna albida, zonis concentricis subæruleis picta, radiatim tenuissime substriata; cicatrix antica elongata, angusta, postica rotundata; sinus pallii perprofundus.

Longit. 44 millim.; diam. 11; alt. 25.

Hab. Station 229, off Travancore coast, in 360 fath.

Thinner and narrower than *T. staurella*; without colour-rays, with more delicate finer concentric sculpture, a less prominent posterior ridge in the right valve, and a shallower groove in the left.

32. *Abra affinis*.

Testa *A. maxima* similima, sed minor, convexior, postice minus producta vel minus cuneiformis, lunula latiore præsertim parte valvæ sinistræ, sinuque lineæ pallii antico magis acuto.

Longit. 27 millim.; diam. 9; alt. 17.

Hab. Off Travancore coast, in 498 fath.

The differences between *A. maxima**, Sow., *A. convexior*†, Smith, and the present species are quite appreciable on comparison, although resembling one another in some respects.

33. *Myodora quadrata*.

Testa compressa, paulo inæquilateralis, postice latissime truncata, antice obtuse cuneiformis; margo dorsi posticus declivis, fere rectilinearis, anticus valde descendens, subrectilinearis quoque, ventralis late curvatus; valva dextra mediocriter profunda, solidiuscula, intus conspicue margaritacea, extus concentricè sulcata et lamellata, area postica porca haud profunda ad umbone radiante obscure limitata; sinus pallii latissimus, haud profundus; valva sinistra —?

Longit. 12½ millim.; alt. 11.

Hab. Station 229, off Travancore coast, in 360 fath.; also Station 233, off Andaman Islands, in 185 fath.

Remarkable on account of the very broad truncated posterior end and the very pearly interior. It is not anticipated that the left valve would offer any special features. It is probably flat and more feebly sulcated than the right.

* Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 169, pl. v. figs. 5, 6.

† Op. cit. 1895, vol. xvi. p. 10, pl. ii. figs. 4, 4 a.

34. *Arca (Barbatia) incerta*.

Testa oblonga, postice latior, valde inequilateralis, costis numerosis tenuibus sulcisque transversis nodose cancellata, alba, epidermide fuscescente plus minus induta; latus anticum angustum, oblique curvatum, posticum magis obliquum, fere rectum, ventrale in medio subincurvum vel subsinuatum; valvæ mediocriter crassæ, impressione levi ab umbone ad marginem ventris radianti notatæ, intus albæ, obsolete radiatim lineatæ; umbones parvi, acuti, hand contigui, longe antrorsum siti; dentes cardinis utrinque umbonem obliqui, posterioribus paucis elongatis; pagina interna alba, radiatim substriata.

Longit. 23 millim.; diam. 8, alt. 11.

Hab. Station 232, off Travancore coast, in 430 fath.

Allied to *A. scabra*, Poli, and *A. nodulosu*, Müller—indeed, perhaps indistinguishable from the latter.

35. *Lima indica*.

Testa *L. excavator* peraffinis, sed minus elongata, striis radiantibus tenuioribus et magis numerosis inculpta.

Longit. 75 millim.; latit. 61; diam. 34.

Hab. Station 232, off Travancore coast, in 430 fath.

Two specimens obtained, one 75 millim. in length, the other 51. In all probability the species attains much larger dimensions, perhaps equalling that of the well-known Norwegian *L. excavata*. There are now three so-called species which are very closely related, namely *L. excavata* (Chemnitz), *L. goliath*, Sowerby, and *L. indica*—indeed they might almost be regarded as varieties of one and the same species. The present form appears to be a trifle less elongate, and the radiating striæ are considerably more numerous and finer. The Japanese *L. goliath* was supposed to be the largest species of the genus, the type specimen having a length of 150 millim. and a width of 110. These dimensions, however, are exceeded in an example of *L. excavata* in the British Museum, which is 170 millim. long and 125 broad.

[To be continued.]

XXV.—*Notes on the Forficularia.*
By MALCOLM BURR, F.Z.S., F.E.S.

- I.—*Forficularia* collected by Mr. W. F. H. Rosenberg in Ecuador.
II.—*Apterygida* or *Sphingolabis*?
III.—A new Species of *Anisolabis* from Ceylon.
IV.—*Forficularia* collected by Mr. Doherty in Macassar and New Guinea.

I.—*FORFICULARIA* COLLECTED BY MR. W. F. H. ROSENBERG
IN ECUADOR.

AMONG a fine collection of Orthoptera which I have received from Mr. W. F. H. Rosenberg, there were twelve species of *Forficularia*, of which no less than seven were new to science; three I have already described in the pages of this Magazine, the remainder work out as follows * :—

Pyragra Saussurei, Dohrn.

Cachabé, 500', XI. '96, 2 ♂, 2 ♀; Chimbo, V. '97, 1 ♀.

This species has been recorded from Mexico, British Honduras, Guatemala, and Costa Rica.

Sparatta nigrina, Stål.

Camp above Chimbo, 3000', VIII. '97, 2 ♂, 1 ♀.

Recorded from Guatemala, Nicaragua, and Rio de Janeiro

Sparatta armata, sp. n.

S. nigrina vicina; statura minore; antennæ 10-segmentatæ; pygidium parvum, quadratum, inerme, apice subsinuatum, angulis acutis; forcipis crura gracilia, subrecta, apice valde decussata, margine interno dente valido medio armata. ♂.

Long. corporis	.....	6 mm.
„ forcipis	.....	2 „

Head black; antennæ with segments 1-7 black, 8-10 white.

Pronotum: anterior border rounded, narrower than the head; posterior border rounded; the two anterior thirds are red, the posterior third black.

Elytra black, truncate at the apex.

Wings projecting well beyond the elytra, black.

Feet testaceous, the tarsi fuscous.

* All the types are in my collection.

Abdomen cylindrical, black; anal segment large, red, quadrate.

Pygidium small, quadrate, the sides slightly dilated, the posterior margin slightly sinuate, the angles pointed.

Forceps with the branches straight, red at the base itself, then black, incurved towards the apex, and strongly decussating, armed on the interior margin at the middle with a strong tooth.

Head, pronotum, elytra, wings, and abdomen pubescent, with short hairs; forceps pubescent, with long fine hairs. ♂.

Patria. Ecuador, camp above Chimbo, 3000', VIII. '97.

This species is closely allied to *S. nigrina*, Stål, but it may be distinguished at once by the much smaller pygidium and shorter forceps, which are armed with only one tooth on each branch inside, and not with two, as in *S. nigrina*.

Psalis Rosenbergi, sp. n.

Statura minore; corpus pilosum; caput convexum; antennæ 15-segmentatæ; pronotum parvum, capite angustius, antice truncatum, postice rotundatum; elytra longa, apice truncata; alæ longæ, valde prominentes; abdomen validum.

Segmentum anale ♂ magnum, medio valde quadrato-emarginatum, latoribus tumidis, margine postico subsinnato, pone angulos emarginato; lamina subgenitalis ♂ magna, apice rotundato-triangularis, media apice sulcata; pygidio nullo; forcipis crura ♂ valida, inermia, basi haud contigua, incurva, apice attenuata et attingentia. Segmentum anale ♀ magnum, margine postico rectum, sulcatum; lamina subgenitalis ♀ obtuse triangularis, haud sulcata; forcipis crura ♀ valida, recta, inermia, tantum apice contigua. ♂ ♀.

	♂.	♀.
Long. corporis.....	15 mm.	13.5-15 mm.
„ forcipis.....	2.25 „	1.75-2 „

Head fuscous, varied with reddish; antennæ black, the segments 11-12 white (sometimes it is other segments that are white, the colour of these organs, as in all earwigs, being very variable).

Pronotum black, sometimes varied with reddish.

Elytra black, with a light red spot anterior to the centre.

Wings red, with a dark spot on the inner margin at the apex.

Feet testaceous, the femora broadly banded with black.

Abdomen black, sometimes varied with reddish.

Forceps entirely black.

Patria. Ecuador, Paramba, 3500', IV. '97 (dry season),
Ann. & Mag. N. Hist. Ser. 7. Vol. iv. 18

1 ♂, 2 ♀; ditto, III. '97, 3 ♀; Chimbo, VIII. '97, 1000', 5 ♀, 1 mutilated specimen; Cachabé, 500', XI. '96, 1 ♀, 2 mutilated specimens.

I have great pleasure in dedicating this handsome species to the intrepid collector Mr. Rosenberg.

It is quite distinct from any other described species of the genus. I have omitted the forceps from the description, as already given in detail in the Latin diagnosis.

I have one specimen, with half the abdomen missing, of a reddish variety, in which the head is entirely red, the pronotum almost entirely so, with one black spot, and the abdomen is red.

Labia arcuata, Scudd.

Camp above Chimbo, 3000', VII. '97, 4 ♂, 2 ♀; Cachabé, low, XI. '97, ♂ ♀.

Labia pallidicornis, Brullé.

Paramba, 3000', V. '97 (dry season), 1 ♂.

Labia, sp. n.

Camp above Chimbo, 3000', VII. '97, 1 ♀.

I refrain from describing this species, as I have only two females and no males.

Labia equatoria, sp. n.

Parva, nitida, glabra; antennæ 8-segmentatæ; pronotum capite angustius, quadratum, antice et postice truncatum, antice quam postice paullo angustius; elytra longa; alæ valde prominentes; pygidium ♂ sat longum, apice subattenuatum, truncatum; segmentum anale ♂ transversum; forcipis crura ♂ basi plus minus dilatata, deplanata, dehinc incurva, attenuata, apicem attingentia; forcipis crura ♀ recta, conica, valida, inermia. ♂ ♀.

	♂.	♀.
Long. corporis	6 mm.	5 mm.
„ forcipis	1.75 „	1.25 „

Head shining black; eyes black; antennæ fuscous.

Pronotum shining, yellow anteriorly, black posteriorly.

Elytra broad, bright shining black.

Wings fuscous, paler at the base.

Feet dark testaceous.

Abdomen cylindrical in ♂, attenuated towards the apex in ♀; shining black, varied with reddish; anal segment varied with reddish.

Pygidium ♂ short and square, slightly narrower at the apex than at the base and sharply truncate, black.

Forceps ♂ with the branches red, varied with black, somewhat dilated at the base, with a small tooth on the inside at the end of the dilated part, then straight and smooth, the apices meeting. ♀ with the branches red, varied with black, straight, conical, smooth, contiguous.

Patria. Ecuador, camp above Chimbo, 3000', VIII. '97, 1 ♂, 1 ♀.

This little species is somewhat like *L. mucronata*. Its most noticeable points are its brilliant shining appearance and the form of the pygidium and forceps of the male.

Spongophora croceipennis (Serv.).

Paramba, 3500', IV. '97 (dry season), 1 ♂.

Spongophora remota (Burr).

Chimbo, 1000', VII. '97, 1 ♂ (type); Cachabé, low, I. '97, 1 ♂, 1 larva; Cachabé, low, XII. '96, ♀ (type); Cachabé to Paramba, II. '97, 2 mutilated specimens.

Spongophora divergens (Burr).

Cachabé, low, XI. '96, 1 ♂, 1 ♀ (type); Paramba, 3500' (dry season), 1 ♂.

The above two species were described by me in this Magazine * as *Forficula*?; but a further examination reveals a deep and long transverse depression on the occiput, showing close relationship with *S. frontalis*, Dohrn, to which M. de Bormans called my attention. They must therefore be included in the genus *Spongophora*.

Opisthocosmia amazonensis, Borin.

Paramba, 3500', V. '97, 1 ♀ (type).

II.—APTERYGIDA OR SPHINGOLABIS?

The name *Apterygida* has been generally rejected by entomologists, while *Sphingolabis* has been universally accepted. The cause of this was Scudder (5), who wrote in 1875 that "*Apterygida* has no *raison d'être*, and therefore must fall." Now *Apterygida* has a *raison d'être*, and, as I will endeavour to show, must stand at the expense of *Sphingolabis*.

* Ann. & Mag. Nat. Hist. (7) vol. iii. pp. 105 & 106 (1809).

Westwood (3) erected the genus *Apterygida* in 1839 for those species of *Forficula* which had rudimentary wings, i. e. *pedestris*, Bon., and *decipiens*, Gén  , which fell into Section   , Division II. of G  n  's (2) arrangement of the genus. Now Scudder is quite correct in saying that *decipiens* cannot be generically separated from *auricularia*, which is the type of *Forficula*, but *pedestris*, Bon. (= *albipennis*, Meg.), can, and must; *albipennis* is the type of *Apterygida*. It is true that Westwood established the genus upon the comparative development of the wings, which in *Forficularia* and Orthoptera generally is now a notoriously variable and untrustworthy character; but the shape of the forceps quite justifies the separation of *albipennis* from *Forficula*, and as there was a genus to hand, of which it was the type, de Bormans's (7) *Sphingolabis*, 1884, is unnecessary.

Of this new genus, which corresponds with Dohrn's (4) Section I. of *Forficula*, the type is *furcifera*, Borm.; but *albipennis* also falls into Section I. of Dohrn's *Forficula*, with the type *albipennis*; the two genera, then, coincide exactly, and *Apterygida*, being the earliest, must stand. The name is unfortunate, but its significance must be forgotten, for it is owing to the forceps, and not to the wings, as originally intended, that it holds good. *Sphingolabis* may be retained for those species which have complete wings or those which have a considerable pygidium, as a subgenus. I am aware that M. de Bormans retains *Sphingolabis*, for he holds that *Apterygida* cannot stand, as erected upon insufficient characters.

Apterygida albipennis (Meg.) and the closely allied *A. arachidis* (Yers.) were included by Brunner (6) in *Chelidura*, Latr.; but this genus must be reserved for those large and heavy flightless forms in which the abdomen is somewhat dilated and the forceps are strong and very stout.

The genera in question must therefore stand as follows:—

Forficula, L. (1), 1758. Type *auricularia*, L.

Apterygida, Westw. (3), 1839. Type *albipennis*, Meg.

(*Sphingolabis*, Borm. (7), 1884, as subgenus. Type *furcifera*.)

Chelidura, Latr., 1825. Type *aptera*, Charp.

Works quoted above.

(1) 1758. LINN  US.—'Systema Natur  ,' ed. x. i. 423.

(2) 1832. G  N  .—'Saggio di una Monografia delle Forficule indigene.' Padova. (Ann. delle Scienze del Regno Lombardo-Veneto, t. ii. p. 215.)

- (3) 1830. WESTWOOD.—‘An Introduction to the Modern Classification of Insects,’ i.
 (4) 1865. DOHRN, H.—“Versuch einer Monographie der Dermapteren” (Stettiner entom. Zeitung, 1865, p. 81).
 (5) 1875. SCUDDER, S. H.—“Critical and Historical Notes on Forficulariæ; including Descriptions of new Generic Forms and an Alphabetical Synonymic List of the described Species” (Proc. Bost. Soc. N. H. xviii. 1875-76, p. 287).
 (6) 1882. BRUNNER VON WATTENWYL, C.—‘Prodromus der europäischen Orthopteren.’ Leipzig.
 (7) 1884. DE BORMANS, A.—“Six nouveaux Forficulaires de Sumatra” (Notes from the Leyden Museum, vi.).

III.—A NEW SPECIES OF *ANISOLABIS* FROM CEYLON.

I have received from Mr. E. E. Green a considerable amount of material from Ceylon, especially of earwigs, which I hope to treat in detail later. One fine new species of *Anisolabis*, however, I describe here.

Anisolabis Greeni, sp. n.

Statura mediocri; corpus totum minutissime granulatum, pilis nonnullis longis pallidis ornatum; antennæ 15-segmentatæ; pronotum quadratum, capite paullo angustius, postice quam antice paullo latius, antice medio subtiliter sulcatum; mesonotum utrinque rudimentaria elytrorum valde prominula gerens; metanotum valde sinuatum; femora compressa; segmentum anale attenuatum, medio sulcatum, in ♂ margine postico tuberculis binis utrinque instructum.

♂ lamina subgenitalis triangularis, obtusa; forcipis crura valida, contigua, conica, inermia, apice valde decussata, cruro dextro supra et fortius incurvo.

♀ lamina subgenitalis obtusa, triangularis; forcipis crura recta, valida, basi distantia, medio dento parvo margine interno armata, apicem versus attenuata, incurva, attingentia vel paullo decussata. ♂ ♀.

	♂.	♀.
Long. corporis	11.5-13 mm.	17 mm.
„ forcipis	2 „	3.25 „

Head convex, shining black; palpi and mouth-parts brick-red; antennæ with first segment brick-red, the rest black, except the four apical segments, which are pale.

Pro-, meso-, and metanota shining black.

Abdomen shining black, reddish beneath.

Feet brick-red, the tarsi testaceous; the femora banded with fuscous at the base and at the apex.

Forceps black.

Patria. Ceylon, Panduloya, V. & X. '97, under stones and in bungalows; II. '99, under stones. 3 ♂, 3 ♀.

Typus in coll. mea.

This species will fall into the group of *A. cineticollis*, Gerst. The contrast of the red and the shining black render it a very handsome species, and it is with great pleasure that I dedicate it to my friend Mr. E. E. Green.

IV.—*FORFICULARIA* COLLECTED BY MR. DOHERTY IN
MACASSAR AND NEW GUINEA.

Labidura Dufourii, Desm.

Macassar. 2 ♂.

Labia amæna, Stål.

Humboldt Bay, New Guinea. 1 ♀.

Psalis indica, Hagenb.

Macassar. 1 ♂.

Chelisoches morio, Fabr.

Humboldt Bay, New Guinea. 1 ♀.

Chelisoches Ritsemæ?, Borm.

Macassar. 1 mutilated ♀, which I refer to this species with some doubt.

Chelisoches melanocephalus, Dohrn.

Macassar. 1 ♀.

Chelisoches Dohertyi, sp. n.

Statura minore; caput nigrum; antennæ 17-segmentatæ, quorum 1-13 atra, 14-15 alba, 16 fuscum, 17 nigrum; pronotum ovale, antice et postice rotundatum, rufum; elytra et alæ nigra; pedes rufi; abdomen fusco-rufescens; forcipis crura rufa, recta, inermia, apice attenuata; pygidium nullum. ♀.

	♀.
Long corporis	9 mm.
„ forcipis	2 „

Patria. Macassar. 2 ♀.

Typus in coll. mea.

This species is very close to *Ch. melanocephalus*, but differs

in the colour of the antennæ, elytra, and wings. It is also very close to a new species which I have quoted as a variety of *Ch. melanocephalus*.

“*Chelisoches semiluteus*, de Bormans, sp. n.

“♂, coll. Brunner. Long. corp. (absque forc.) 8.5 mm., forc. 2.5 mm. Mat, des poils pâles. Il reste aux antennes 15 articles, les 4 premiers jaunes; 5–10 bruns; 11, 12 jaunes pâles, 13–15 bruns. Tête noire. Pronotum testacé fauve. Elytres bruns. Ecaïlle alaire brune plus foncée. Pattes testacées fauves. Abdomen rouge brun clair. Pygidium nul. Branches de la pince ♂ courtes, robustes, larges, déprimées, écartées à la base, et formant chacune un arc allongé très régulier jusqu’aux pointes émoussées et contiguës. Aïète interne armée de 2 petites dents situées, l’une au quart, l’autre au-delà des $\frac{3}{4}$ de la longueur. W. Java, Pengalengan (*Fruhstorfer*), 4000’.”

The above description I have received *in litt.* from M. de Bormans, and to this species I now refer the variety of *Ch. melanocephalus* mentioned by me in this Magazine (*Chelisoches melanocephalus*, Dohrn, var. nov., Burr, Ann. & Mag. Nat. Hist. (6) xx. 1897, p. 315).

The three species in question may be separated as follows:—

1. Elytra flava *melanocephalus*, Dohrn.
- 1, 1. Elytra fusca vel nigra.
2. Antennæ articulis 1–13 nigris . . . *Dohertyi*, n.
- 2, 2. Antennæ articulis 1–4 flavidis,
5–10 fuscis *semiluteus*, Borm.

Ch. melanocephalus was described by Dohrn from specimens from Tranquebar. The type of de Bormans’s *semiluteus* in the Brunner collection is from exactly the same locality as the specimen recorded by me as a new variety. A second specimen of the same in my collection shows that the complete antennæ are the same as in de Bormans’s type. The three species will then stand as follows:—

Chelisoches melanocephalus, Dohrn.

Lobophora melanocephala, Dohrn, Stett. ent. Zeit. 1865.

Chelisoches melanocephalus, Scudd. Proc. Bost. Soc. N. H. xviii. 1875–76, p. 308; Borm. Ann. Mus. Civ. Gen. (2) vi. p. 440 (1888); Borm. op. cit. xiv. p. 392 (1894) (nec Burr).

Antennæ articulis 1–2 nigris, ceteris brunneis; elytra et alæ flavo-testacea.

Patria. Tranquebar (*Dohrn*), Burmah (*Borm.*), Macassar (coll. m.).

Chelisoches Dohertyi, n.

Antennæ 17-segmentatæ, articulis 1-13 atra, 14-15 alba, 16 fuscum, 17 nigrum; elytra et alæ nigra.

Patria. Macassar (coll. m.).

Chelisoches semiluteus, Borm., n.

Chelisoches melanocephalus, Dohrn, var. nov., Burr, Ann. & Mag. Nat. Hist. (6) xx. p. 316 (1897).

Antennæ 15-segmentatæ, 1-4 testaceis, 5-10 brunneis, 11-12 pallidis, 13-15 fuscis; elytra et alæ fusco-brunnea.

Patria. W. Java, Pengalengan (coll. Brunner, coll. mea).

Chelisoches Fææ, Borm.

Milne Bay, New Guinea. 1 ♀.

Opisthocosmia armata, de Haan.

Macassar. 5 ♂.

Opisthocosmia forcipata, de Haan.

5 ♀, Sangir, of the variety with the red head (v. Burr, *op. cit.* p. 316).

Opisthocosmia tenella, de Haan.

Macassar. 1 ♀.

Forficula Alberti, Dubr.

Milne Bay, New Guinea. 1 ♀.

Dormans Park, East Grinstead,
August 3rd, 1899.

XXVI.—*Key to the Isopods of the Pacific Coast of North America, with Descriptions of Twenty-two new Species.* By HARRIET RICHARDSON.

[Continued from p. 187.]

III. VALVIFERA.

Analytical Key to the Families of Valvifera.

- a. Body more or less broad, depressed. Legs usually nearly alike, but first three pairs sometimes with propodus dilated and dactylus reflexed. IX. IDOTEIDÆ.

- a'*. Body narrow, scarcely depressed. Four anterior pairs of legs unlike three posterior pairs, and not ambulatory nor strictly prehensile, directed forward, slender, ciliated, with terminal joint minute; last three pairs are stouter, ambulatory, with terminal joint bifid.

X. ARCTURIDÆ.

Family IX. Idoteidæ.

Analytical Key to the Genera of Idoteidæ *.

- a*. Sides of head emarginate or cleft and laterally produced beyond eyes, which are situated upon its dorsal surface. Three anterior pairs of legs, with penultimate joint or propodus dilated and forming, with reflexible dactylus, a prehensile hand 17. *Glyptonotus*.
- a'*. Sides of head in a dorsal view entire and not laterally produced. Eyes lateral. Legs all ambulatory; three anterior pairs with penultimate joint not or not much dilated.
- b*. Flagellum of second pair of antennæ well developed and multiarticulate.
- c*. Palpus of maxillipeds four-jointed. Epimera of all the segments well developed and evident in a dorsal view. Abdomen† consisting of three‡ segments with lateral sutures, indicative of another partially coalescent segment .. 18. *Idotea*.
- c'*. Palpus of maxillipeds not four-jointed. Abdomen consisting of one segment, uniaarticulate.
- d*. Maxillipeds with a three-jointed palp. All the epimera coalesced and perfectly united with the segments 19. *Synidotea*.
- d'*. Maxillipeds with a two-jointed palp. Epimera of second, third, and fourth segments coalesced and perfectly united with the segments; those of the fifth, sixth, and seventh segments distinct and well developed 20. *Colidotea*, gen. nov.
- b'*. Flagellum of second pair of antennæ with joints all consolidated and forming a single piece, or with flagellum composed of only two or three joints.
- c*. Body smooth, linear. Epimera of all the thoracic segments distinct and visible; those of the second, third, and fourth segments short and narrow; those of

* See Miers on the Idoteidæ, Journ. Linn. Soc. London, Zool. xvi. 1883, pp. 9, 19, 20.

† Including terminal segment.

‡ Dollfus, Feuille des Jeunes Naturalistes, 3^e sér. 1895, p. 4; Sars, Crust. of Norway, 1897, pts. 3, 4, p. 79.

- the fifth, sixth, and seventh segments large and broad. Palp of maxillipeds two-jointed. 21. *Cleantis*.
- c'. Body smooth, ovate. Epimera of second, third, fourth, and fifth thoracic segments conflated with segments; those of sixth and seventh segments distinct and visible. Palp of maxillipeds three-jointed. Joints of flagellum all consolidated and forming a single piece [nov.] 22. *Eusymmerus*, gen.

17. GLYPTONOTUS, Eights.

Analytical Key to the Species of Glyptonotus *.

- a. Joints of the peduncle of antennæ not dilated; flagellum eight- to fourteen-jointed. Antero-lateral cervical lobes prominent 35. *G. entomon* (Linnaeus).
- a'. Joints and peduncle of antennæ greatly dilated; flagellum seven- to eight-jointed. Antero-lateral cervical lobes not prominent 36. *G. Sabini* (Kröyer).

35. *Glyptonotus entomon* (Linnaeus).

Oniscus entomon, Linnaeus, Syst. Nat. 12th ed. ii. 1766, p. 1060; Pallas, Spicil. Zool. ix. 1772, p. 64, pl. v. figs. 1-6.

(?) *Entomon pyramidale*, Klein, Rém. sur les Crustacés, figs. 1-3.

Squilla entomon, De Geer, Mém. pour servir à l'Hist. des Insectes, vii. 1778, p. 514, pl. xxxii. figs. 1-10.

Asellus entomon, Olivier, Encycl. Méth. 1789, p. 253.

(?) *Cymothoa entomon*, Fabricius, Ent. Syst. ii. 1793, p. 505.

Idotea entomon, Rosc, Hist. Nat. des Crust. ii. 1802, p. 178; Latreille, Hist. Nat. Crust. et Ins. vi. 1803-4, p. 361, vii. pl. lviii. figs. 2, 3;

(?) Lamarck, Hist. des Anim. sans. Vert. 1st ed. v. 1818, p. 159;

(?) Desmarest, Consid. Crust. 1825, p. 289; Rathke, Neue Schriften der naturf. Gesellsch. in Danzig, i. 1820, p. 109, pl. iv.; Kröyer, Vid. Selsk. Skrift. vii. 1838, p. 323; Milne-Edwards, Hist. Nat. Crust. iii. 1840, p. 128; Kröyer, Nat. Tidsskr. ii. 1847, p. 402; White, List Or. Brit. Mus. 1847, p. 93; Brandt, Or. in Middendorff's Sibirische Reise, ii. 1851, p. 145; Moinert, Nat. Tidsskr. 3rd ser. xi. 1877, p. 84; Brandt, Comptes Rendus, 1880, p. 713; Ann. & Mag. Nat. Hist. vi. 1880, p. 98.

(?) *Saduria entomon*, Adams, in White, Sutherland's Voy. Baffin's Bay &c., Appendix, 1852, p. ccvii.

Idotea longicauda, Lockington, Proc. Cal. Acad. Sci. vii. 1877, pt. i. p. 45.

Glyptonotus entomon, Miers, Trans. Linn. Soc. London, xvi. 1883, pp. 12, 13, pl. i. figs. 1, 2. (See Miers for further synonymy.)

Hab. Circumpolar; west coast of North America to Pacific Grove, California.

* This key is taken from Miers, Journ. Linn. Soc. London, Zool. xvi. (1883), p. 11.

36. *Glyptonotus Sabini* (Krøyer).

Idotea Sabini, Krøyer, Nat. Tidsskrift, 2nd ser. ii. 1847, p. 401; Atlas of Crust. in Gaimard's Voy. en Scand. pl. xxvii. fig. 1; Reinhardt, Fortegnelse over Grønland's Kreebsdyr, 1857, p. 34; Lüthen, List of Crust. of Greenland in Arctic Manual, 1875, p. 149; Sars, Arch. f. Math. og Naturvidensk. ii. 1877, p. 350.

Chiridothea megatura, G. O. Sars, Archiv f. Math. og Naturvidensk. iv. 1880, p. 432.

Glyptonotus Sabini, Miers, Journ. Linn. Soc. London, Zool. xvi. 1883, pp. 15, 16, pl. 1. figs. 3-5. (See Miers for further synonymy.)

Hab. Circumpolar; west coast of North America (*Miers*).

18. IDOTEA, Fabricius.

Analytical Key to the Species of Idotea *.

- a. Terminal segment emarginate at its extremity 37. *I. resecata*, Stimpson.
- a'. Terminal segment not emarginate at its extremity.
 - b. Body slender, linear, filiform.
 - c. Terminal segment truncate at apex .. 38. *I. gracillima*, Dana.
 - c'. Terminal segment acute at its extremity.
 - d. Postero-lateral angles of terminal segment prominent and separated by a tooth from subtriangular middle portion, which bears a small tooth at the middle 39. *I. urotoma*, Stimpson.
 - d'. Postero-lateral angles not separated by a tooth from middle portion .. 40. *I. rectilineata*, Lockington.
 - b'. Body oblong-ovate.
 - c. Terminal segment regularly rounded, with small median point 41. *I. Woesensenskii*, [Brandt].
 - c'. Terminal segment triangulate posteriorly, with subparallel sides.
 - d. Epimera of second, third, and fourth segments short, not reaching the post-lateral angles of their respective segments 42. *I. ochotensis*, Brandt.
 - d'. Epimera of all the segments reaching the post-lateral angles of their respective segments.
 - e. Sides of thorax arcuate 43. *I. stenops*, Benedict.
 - e'. Sides of thorax more nearly parallel 44. *I. Whitei*, Stimpson.

37. *Idotea resecata*, Stimpson.

Idotea resecata, Stimpson, Bost. Journ. Nat. Hist. vi. 1857, p. 64, pl. xxii. fig. 7; Proc. Bost. Soc. Nat. Hist. 1859, p. 88; Miers, Journ. Linn. Soc. London, Zool. xvi. 1883, p. 45.

* See Miers, Journ. Linn. Soc. London, Zool. xvi. 1883, p. 43.

Hab. Straits Juan de Fuca, opposite Fort Townsend, Vancouver Island; Gulf of Georgia, Orcas Island; Pacific Grove, San Pedro, and Monterey Bay, California.

38. *Idotea gracillima*, Dana.

Idotea gracillima, Dana, Proc. Acad. Nat. Sci. Philad. vii. 1854, p. 175; Stimpson, Bost. Journ. Nat. Hist. vi. 1857, p. 505; Miers, Journ. Linn. Soc. London, Zool. xvi. 1883, p. 35.

Hab. California.

39. *Idotea urotoma*, Stimpson.

Idotea urotoma, Stimpson, Proc. Acad. Nat. Sci. Philad. 1864, p. 155; Miers, Journ. Linn. Soc. London, Zool. xvi. 1883, p. 34.

Hab. Puget Sound.

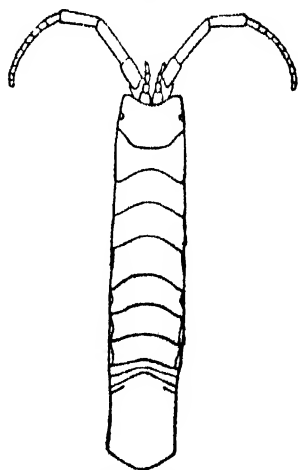
40. *Idotea rectilineata*, Lockington.

Idotea rectilineata, Lockington, Proc. Cal. Acad. Sci. vii. 1877, pt 1, p. 36; Miers, Journ. Linn. Soc. London, Zool. xvi. 1883, p. 34.

Hab. Along the Pacific coast from Humboldt County, California, to Ensenada, Lower California.

From an examination of specimens, this species, which Miers * says is scarcely to be distinguished from *I. ochotensis*, Brandt, is seen to be specifically distinct. It differs from *I. ochotensis* in the proportions of the body, *I. rectilineata* being more slender—about five times as long as broad—while in *I. ochotensis* the length is only three and a half times greater than the width; in the relative length of the antennæ to the body and the proportions of the joints in the peduncle of the antennæ, the antennæ in *I. ochotensis* reaching only to the posterior margin of the third thoracic segment (in all the specimens examined), the joints of the peduncle being short and stout, while in *I. rectilineata* the antennæ extend to the posterior margin of the fifth thoracic segment, the joints of the peduncle being long and slender; in the form of the anterior margin of the head,

Fig. 20.



Idotea rectilineata, Lockington.
× 2.

* Journ. Linn. Soc. London, Zool. xvi. 1883, p. 34.

the excavation being deeper and wider in *I. rectilineata* than in *I. ochotensis*; in the shape of the first thoracic segment, which in *I. ochotensis* is produced laterally and has the antero-lateral angles truncate, while in *I. rectilineata* this segment is not produced and has rounded antero-lateral angles; in the size of the epimera, which are much more slender in *I. rectilineata* than in *I. ochotensis*; and in the shape of the terminal segment of the body, the posterior angle of which in *I. ochotensis* is more acute, the line from the lateral angle to the median angle being excavate, while in *I. rectilineata* this line is straight and the median angle obtuse.

41. *Idotea Wosnesenskii*, Brandt.

Idotea Wosnesenskii, Brandt, Middendorff's Sibirische Reise, ii. 1851, Crust. p. 146; Stimpson, Bost. Journ. Nat. Hist. vi. 1857, p. 504; Spence Bate, Lord's Naturalist in British Columbia, ii. 1860, p. 281; Miers, Journ. Linn. Soc. London, Zool. xvi. 1883, p. 40.

Idotea hirtipes, Dana, Cr. U.S. Expl. Exp. pt. ii. 1853, p. 704, pl. xlvii. fig. 6.

Idotea oregonensis, Dana, Proc. Acad. Nat. Sci. Philad. vii. 1854, p. 175.

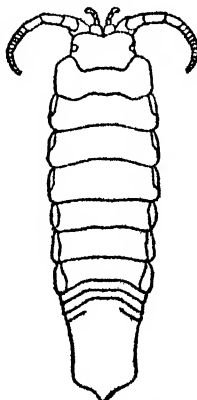
Idotea media (Dana?), Spence Bate, Lord's Naturalist in British Columbia, ii. 1860, p. 282.

Hab. Sea of Ochotsk and Kamchatka Sea; west coast of North America to Monterey Bay, California.

42. *Idotea ochotensis* *, Brandt.

Idotea ochotensis, Brandt, Middendorff's Sibirische Reise, ii. 1851, Crust. p. 145, pl. vi. fig. 33; Miers, Journ. Linn. Soc. London, Zool. xvi. 1883, p. 32, pl. i. figs. 8-10.

Fig. 21.



Idotea ochotensis, Brandt. $\times 2$.

* The following is quoted from Miers, Journ. Linn. Soc. London, Zool. xvi. 1883, p. 63:—"Mr. Spence Bate (Lord's 'Naturalist in British

Hab. Awatatch Bay, Sea of Ochotsk; north-west coast of North America to Vancouver Island (Miers).

43. *Idotea stenops*, Benedict.

Idotea stenops, Benedict, Proc. Biol. Soc. Washington, xii. 1898, pp. 54, 55.

Hab. Monterey, California.

44. *Idotea Whitei*, Stimpson.

Idotea Whitei, Stimpson, Proc. Acad. Nat. Sci. Philad. 1864, p. 155; Miers, Journ. Linn. Soc. London, Zool. xvi. 1883, pp. 42, 43.

Hab. Puget Sound; Monterey Bay, California, collected by Mr. Heath.

A specimen from Monterey Bay, California, agrees with Miers's description of two males received from California, which he refers to this species. It is unlike *Idotea Wosnesenskii* in the following points, and from an examination of a large number of individuals of *I. Wosnesenskii*, in which these points remain constant, it seems to demonstrate the impossibility of uniting the two species:—

1. "Form of epimera of second to fourth thoracic segments, which reach quite to the postero-lateral angles of these segments.

2. "Epimera of the second segment are broader anteriorly, and the terminal segment more resembles that of *I. ochotensis*, being more angulated and less rounded at the postero-lateral angles" *.

3. The absence of hairs on the legs.

The legs of *I. Wosnesenskii* (the males) are thickly covered with hairs and very bushy in appearance.

4. The smooth margins of the epimera, which in *I. Wosnesenskii* have thickened edges.

19. SYNIDOTEA, Harger.

Analytical Key to the Species of Synidotea †.

- a. Abdomen emarginate or notched at its distal end.
- b. Two spines or tubercles overhanging the frontal notch.
- c. Spines united near the base 45. *S. pallida*, Benedict.

Columbia,' ii. 1866, p. 282) refers, without any description, specimens from Esquimaux Harbour, British Columbia, to *Idotea stricta*, Dana; it is far more probable that they belong to *Idotea ochotensis*."

* Miers, Journ. Linn. Soc. London, Zool. xvi. 1883, pp. 42, 43.

† Benedict, Proc. Acad. Nat. Sci. Philad. (1897), p. 591.

- c'. Tubercles free at base 46. *S. erosa*, Benedict.
 b'. No spines or tubercles overhanging frontal notch.
 c. With a low ridge arising between the eyes and interrupted on the median line.
 d. Outlines of abdomen subparallel. 47. *S. nebulosa*, Benedict.
 d. Outlines strongly arcuate 48. *S. angulata*, Benedict.
 c'. Without a ridge between the eyes.
 d. Outline of abdomen subtriangular.
 e. Front not excavated 49. *S. consolidata* (Stimpson).
 e'. Front excavated 50. *S. bicuspidata* (Owen).
 d'. Outlines of abdomen rounded.
 e. Length of abdomen equal to width at base 51. *S. laticauda*, Benedict.
 e'. Length of abdomen equal to one and one-half times width at base 52. *S. Harfordi*, Benedict.
 a'. Abdomen pointed.
 b. Undulations of body not tubercular or spiny.
 c. Tubercle in front of eyes not margined 53. *S. nodulosa* (Kröyer)
 c'. Tubercle on the frontal margin and forming a part of it 54. *S. levis*, Benedict.
 b'. Undulations of the body tubercular and spiny.
 c. Four spines on the front of the head; body spinous 55. *S. muricata* (Harford).
 c'. A wedge-shaped tubercle behind the frontal notch; body tubercular 56. *S. picta*, Benedict.

Mr. Adrian Dollfus, in his paper on "Les Idoteidæ des Côtes de France" *, has wrongly confounded *Synidotea*, Harger, with *Stenosoma*, Leach. *Synidotea* can by no means be considered a synonym of *Stenosoma*, as anyone who is familiar with the two genera will undoubtedly admit. It differs from *Stenosoma* in the consolidation of the epimera with the segments. The epimera are firmly and perfectly united with the segments, and the only trace or indication of a separation is represented in the anterior segments by a slight and almost imperceptible notch in the posterior margins, halfway between the lateral margin and the median line of the body, and in the three posterior segments by a very faint line. In *Stenosoma* all the epimera are very distinct from the segments.

* 'Feuille des Jeunes Naturalistes,' 1895.

45. *Synidotea pallida*, Benedict.

Synidotea pallida, Benedict, Proc. Acad. Nat. Sci. Philad. 1897, pp. 396, 397.

Hab. Chirikof Island, Alaska.

46. *Synidotea erosa*, Benedict.

Synidotea erosa, Benedict, Proc. Acad. Nat. Sci. Philad. 1897, pp. 397, 399.

Hab. Sannakh Island, Alaska.

47. *Synidotea nebulosa*, Benedict.

Synidotea nebulosa, Benedict, Proc. Acad. Nat. Sci. Philad. 1897, pp. 394, 395.

Hab. Unalaska, Kyska Harbour, Semidi Islands, Unimak Island, Bering Sea, Kamchatka.

48. *Synidotea angulata*, Benedict.

Synidotea angulata, Benedict, Proc. Acad. Nat. Sci. Philad. 1897, pp. 395, 396.

Hab. Off Cape Johnson, Washington; off Destruction Island, Washington; off Cape Flattery, Washington.

49. *Synidotea consolidata* (Stimpson).

Idotea consolidata, Stimpson, Proc. Cal. Acad. Sci. i. 1856, p. 89; Best Journ. Nat. Hist. vi. 1857, p. 503.

Edotia bicuspidata, Miers, Journ. Linn. Soc. London, Zool. xvi. 1843, p. 66.
Synidotea consolidata, Benedict, Proc. Acad. Nat. Sci. Philad. 1897, p. 393.

Hab. Pacific Grove, California.

50. *Synidotea bicuspidata* (Owen).

Idotea bicuspidata, Owen, Crustacea of the 'Blossom,' 1839, p. 92, pl. xxvii. fig. 6.

Idotea pulchra, Lockington, Proc. Cal. Acad. Sci. vii. 1877, p. 44.

Idotea bicuspidata, Miers, Journ. Linn. Soc. London, Zool. xvi. 1843, p. 66.

Synidotea bicuspidata, Sars, Crust. Norwegian North-Atlantic Expedition, 1885, p. 116, pl. x. figs. 24-26; Benedict, Proc. Acad. Nat. Sci. Philad. 1897, pp. 391, 392.

Hab. West coast of Alaska and Bering Sea.

51. *Synidotea laticauda*, Benedict.

Synidotea laticauda, Benedict, Proc. Acad. Nat. Sci. Philad. 1897, pp. 393, 394.

Hab. San Francisco Bay.

52. *Synidotea Harfordi*, Benedict.*Idotea marmorata*, Harford, Proc. Cal. Acad. Sci. vii. 1877, p. 117.*Synidotea Harfordi*, Benedict, Proc. Acad. Sci. Philad. 1897, p. 402.*Hab.* Magdalena Bay, Lower California.53. *Synidotea nodulosa* (Kröyer).*Idotea nodulosa*, Kröyer, Naturhist. Tidsskr. ii. 1846, p. 100.*Synidotea nodulosa*, Harger, Report of U.S. Commissioner of Fish and Fisheries, 1878, pt. 6, pp. 351, 352; Benedict, Proc. Acad. Nat. Sci. Philad. 1897, pp. 398, 399.*Hab.* Dixon Entrance, north of Queen Charlotte Islands, British Columbia.54. *Synidotea levis*, Benedict.*Synidotea levis*, Benedict, Proc. Acad. Nat. Sci. Philad. 1897, pp. 399, 400.*Hab.* Between Bristol Bay and Pribilof Islands, Alaska; Bering Sea.55. *Synidotea muricata* (Harford).*Idotea muricata*, Harford, Proc. Cal. Acad. Sci. vii. 1877, pt. 1, p. 117.*Synidotea muricata*, Benedict, Proc. Acad. Nat. Sci. Philad. 1897, p. 400.*Hab.* Icy Cape.56. *Synidotea picta*, Benedict.*Synidotea picta*, Benedict, Proc. Acad. Nat. Sci. Philad. 1897, pp. 401, 402.*Hab.* Alaska and Bering Straits.

Fig. 22

Maxilliped of *Colidotea rostrata* (Benedict).

20. COLIDOTEA *, gen. nov.

57. *Colidotea rostrata* (Benedict).

Idotea rostrata, Benedict, Proc. Biol. Soc. Washington, xii 1893, pp 53, 54.

Hab. San Pedro, California.

21. CLEANTIS, Dana.

Analytical Key to the Species of Cleantis.

- a Flagellum consolidated and forming a single piece. Sides of abdomen not separated by an acute tooth from rounded posterior portion 58 *C. occidentalis*, sp. n.
 a'. Flagellum composed of three joints. Sides of abdomen separated by an acute tooth from rounded posterior portion 59 *C. Heathi*, sp. n.

58. *Cleantis occidentalis*, sp. n.

Body narrow, elongate; surface smooth.

Head of same width as thoracic segments and with a small median anterior depression. Eyes lateral. First pair of antennæ consisting of four joints, reaching the middle of the third joint of the second pair of antennæ. Second pair of antennæ contain six joints (five seen from a dorsal view), the last joint being the flagellum.

The thoracic segments show a gradual though marked decrease in length, the first one being the longest and somewhat excavate on its anterior margin. The epimera of the second, third, and fourth segments are short and narrow, reaching but half the length of the segments, while those of the last three segments are broad, with their posterior angles produced beyond the segments.

The abdomen is composed of four segments—three short ones and the terminal segment, which bears suture-lines indicative of another coalesced segment. The terminal segment is rounded posteriorly. The anterior three fourths of the segment is raised considerably above the posterior fourth, which is flat, and there is a groove in the median line on the posterior third of the anterior part of the segment.

The legs are similar to those of the type species of the genus. The three anterior pairs increase in length, the third pair being the longest, and all are directed anteriorly. The fourth pair are very short and fold across the body. The last

* See key on p. 261 for characters of genus.

three pairs increase in length, the seventh pair being the longest, and all these are directed posteriorly. The legs are compact and lie folded on the ventral side and cannot be seen from a dorsal view.

Fig. 23.

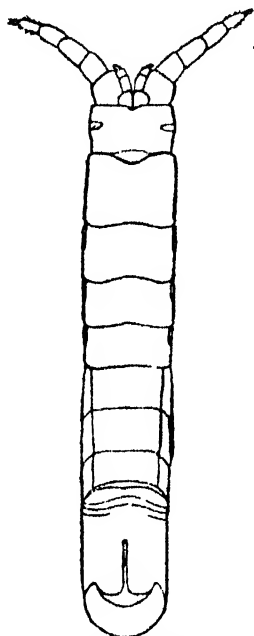


Fig. 24.

Fig. 23.—*Cleantis occidentalis*. $\times 10$ Fig. 24.—Maxilliped of *Cleantis occidentalis*, greatly enlarged.

There is but one specimen, collected by the 'Albatross' in 1888 at Magdalena Bay, Lower California; depth 12 fathoms. Type. No. 22578, U.S. N. M.

This species, when compared with *Cleantis planicauda**,

* *Cleantis planicauda*, Benedict, sp. n.

Body linear, densely granulated, five times longer than broad. Feet folded beneath, out of view from above. Body lined longitudinally by six more or less broken black lines. The lines on the sides are more distinct than those above.

Head subquadrate, partially immersed in the first thoracic segment and rounded on the posterior margin; sides parallel, anterior margin emarginate; a deep depression or groove runs from the median notch to the

Benedict, from Pensacola, Florida, presents points of difference which are interesting and which can easily be recognized in the manuscript quoted in the footnote (pp. 271-273).

59. *Cleantis Heathii*, sp. n.

Body slender, elongate; surface smooth.

Head with lateral margins straight; anterior margin slightly excavate. Eyes small, lateral. First pair of antennæ consist of four joints and are a little longer than half the width of the head. The second pair of antennæ are half as long as the body and are composed of nine joints, the three terminal ones forming the flagellum, which cannot be distinguished from the peduncle.

Thoracic segments subequal, with narrow epimera, those of the second, third, and fourth segments reaching but half the length of the segments, the last three epimera extending to the extremity of the segments.

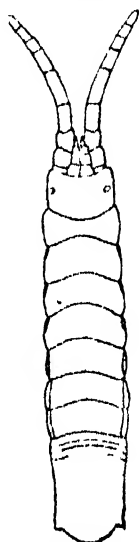
The abdomen is composed of three segments with suture-lines indicative of another. The terminal segment is broadly rounded posteriorly, with small but acute lateral angles. The sides are almost parallel.

The first four pairs of legs are directed anteriorly; the last three extend in a posterior direction. There is no perceptible inequality in length. The dactyli are bifid.

Two specimens were sent by Mr. Heath from Monterey Bay, California.

Type. No. 22577, U.S. N. M.

Fig 25.



Cleantis Heathii. $\times 6\frac{1}{2}$.

centre of the head. The eyes are situated near the antero-lateral angle; postoccipital lobe distinct; antennæ with six segments, first very short and nearly immobile, second very short and stout; the third segment is equal in length to the second, but not so stout; the fourth and fifth are of equal length and about one third longer than the second and third segments. The terminal segment or flagellum is lighter in colour and is armed with short bristles. The length of the antennæ is equal to the length of the head and first two thoracic segments. The antennulæ extend to the middle of the third segment of the antennæ. The first segment is

22. *EUSYMMERUS*, gen. nov.

Body elliptical. Palp of maxillipeds three-jointed. Second pair of antennæ with joints of flagellum all consolidated and forming a single piece. Eyes dorsally situated.

Lateral margins of thoracic segments expanded, edges straight and full. Epimera of second, third, fourth, and fifth segments coalesced and firmly united with segments, those of the sixth and seventh segments distinct and visible.

Abdomen composed of one segment, with suture-lines indicative of another partly coalesced segment.

60. *Eusymmerus antennatus*, sp. n.

Body elliptical, tapering toward the extremity; surface smooth.

Head three times broader than long, with the antero-lateral angles prominent. Anterior margin excavate. Lateral margins expanded. Eyes situated dorsally on the extreme lateral margin in the median transverse line. First pair of antennæ four-jointed, short, extending only a little beyond the second joint of the second pair of antennæ. Second pair of antennæ are six-jointed, geniculate, the last or flagellar joint being somewhat clavate.

quadrate, the second subquadrate, the third is pear-shaped, the fourth segment is very small

The segments of the thorax are nearly equal in length and breadth, the third and fourth being but little longer than the others. The epimera of the second, third, and fourth segments are very small and cannot be seen from above. On the fifth, sixth, and seventh segments the epimera are large and project well behind the margin of the segment in the form of an acute angle.

The pleon is composed of four segments; the first three are very narrow; the terminal segment is elongated, with subparallel sides. A marked character of the pleon is its obliquely truncated extremity. The oblique terminus is perfectly flat, with a raised margin.

The feet of this species, as in the typical species described by Dana, are in two series. The first is composed of the first three pairs of feet, which are comparatively stout and increase in length to the third segment. The second series begins on the fourth segment with a pair of short feet, which fold transversely; the other pairs are successively longer and fold backwards. The feet of the second series are much more slender than those of the first. The dactyli of all are biungulate. The carpal and propodal joints are spinulose beneath.

The operculum is not traversed by an oblique line. The sides of the basal segment are subparallel. The terminal segment is about as broad as long.

Length 15 millim.; width 3 millim.

Type. No. 22579, U.S. N. M.

Thoracic segments with lateral margins expanded. Lateral edges straight, full. Epimera of second, third, fourth, and fifth segments coalesced and firmly united with the segments; epimera of sixth and seventh segments distinct and articulating with segments.

Fig. 26.

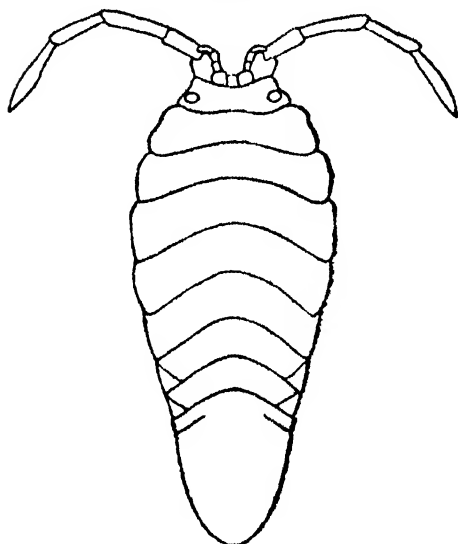


Fig. 27.

Fig. 26.—*Eusymmerus antennatus*. $\times 8$.Fig. 27.—Maxilliped of *Eusymmerus antennatus*.

Abdomen of only one segment, with suture-lines indicative of another partly coalesced segment. Abdomen posteriorly rounded, tapering from the base to the extremity.

Legs slender, with dactyli biunguiculate.

Colour of specimen brown. Lateral edges of thoracic segments colourless.

One individual from off Abreojos Point, Lower California, Station 2835, was collected by the U.S. Fish Commission steamer 'Albatross'; depth 48 fathoms.

Type. No. 22580, U.S. N. M.

Family X. Arcturidae.

23. ARCTURUS, Latreille.

Flagellum of second pair of antennæ more than four-jointed.

Fourth segment of thorax not greatly longer than others. Marsupium of female composed of four pairs of plates. Posterior thoracic legs biunguiculate.

Analytical Key to the Species of Arcturus.*

- a. End of abdomen notched as seen from above.
- b. Body smooth and free from spines . . . 61. *A. beringanus*, Benedict
- b'. Body spiny.
- c. Head and six segments of thorax each with a pair of spines on the dorsum. Second and third articles of antennæ without spines 62. *A. longispinis*, Benedict.
- c'. Head and segments of thorax with not less than two pairs of spines to the segment.
- d. Head with one large median spine on anterior part of head in front of eyes 63. *A. intermedius*, sp. n.
- d'. Head with three spines on anterior part of head in front of eyes. 64. *A. Murdocki*, Benedict.
- a'. End of abdomen without notch 65. *A. glaber*, Benedict.

61. *Arcturus beringanus*, Benedict.

Arcturus beringanus, Benedict, Proc. Biol. Soc. Washington, xii 1898, pp 46, 47.

Hab. Alaska ; Bering Sea.

62. *Arcturus longispinis*, Benedict.

Arcturus longispinis, Benedict, Proc. Biol. Soc. Washington, xii. 1898, pp. 44, 45.

Hab. Aleutian Islands.

63. *Arcturus intermedius*, sp. n.

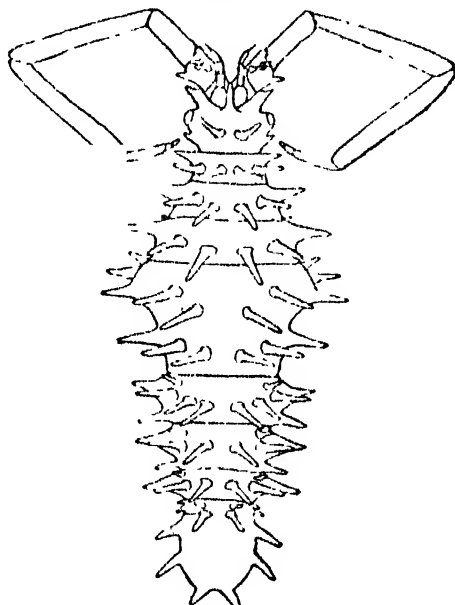
Head with a deep excavation on its anterior margin, the antero-lateral angles being produced in a double process, the inner one rounded, the outer one acutely pointed. Near the anterior margin in the median line is one large spine. Just back of the eyes and between them are two long spines. The lateral margins of the head are produced in two small angulations, with a rounded sinus between, posterior to the double antero-lateral process. On the post-lateral margin on either side of the head is a small spine.

The first pair of antennæ are small and short, not reaching

* Dr. Benedict's key is used in part for the genus *Arcturus*. Proc. Biol. Soc. Washington, xii. (1898) pp. 42, 43.

to the end of the second joint of the second pair of antennæ. The first joint of the second pair of antennæ is visible and unarmed; the second joint is armed with three spines; the third joint is unarmed and is about twice as long as the second joint; the fourth and fifth joints are about equal in length and are each about twice as long as the third; the flagellum contains three joints.

Fig. 28.

*Arcturus intermedius.* $\times 10$.

The first, second, and third thoracic segments have a transverse row of six large spines, three on either side of the median longitudinal line, the two centre ones being the longest, although all are very long. The fourth segment is twice as long as any of the other segments and has a transverse constriction on the posterior half of the segment. On the anterior portion are six spines, three on either side of the median line, the four outer ones being in a straight line, the inner two below this line. On the posterior portion are six spines also, three on either side of the median line. The fifth thoracic segment has twelve spines, six on either side of the median line. The sixth segment has ten spines, five on either side. The seventh and last segment has eight spines, four on either side.

The abdomen is composed of two segments. The first is short, with twelve spines, six on either side of the median line, the four inner ones being arranged in two longitudinal series, the two upper ones being small, the two lower ones very long. The terminal segment has the upper surface smooth. This segment terminates in two long divergent spines. There is a single spine on the lateral margin on either side halfway down the segment. The three anterior pairs of legs have each two spines on the coxal joint and one spine on the basis. The body increases in width from the first to the fourth segment, and then decreases in width from the fourth to the terminal segment.

One specimen from Kyska Harbour, Aleutian Islands, 10 fathoms, collected by Mr. W. H. Dall.

Type. No. 22581, U.S. N. M.

Our species differs from *A. Murdochii* in the absence of spines on the third joint of the second pair of antennæ; in the greater length of this joint in relation to the preceding joint; in the greater length of the two following joints; in the presence of a single spine on the anterior part of the head, while in *A. Murdochii* there are three, and of two spines on the posterior part, while in *A. Murdochii* there are four; in the absence of two small spines just below the constriction in the fourth segment; in the absence of the row of spines on the terminal segment of the body; and in the presence of two spines on the coxal joint and one on the basal joint of the legs, while in *A. Murdochii* there is but one spine on the basal joint.

This species is also distinguished from *A. hystrix* in the presence of a single median spine on the anterior part of the head, while in *A. hystrix* there are two, one on either side of the median line and widely separated; in the presence of two spines on the posterior part of the head, while in *A. hystrix* there are four; in the absence of the double row of spines on the terminal segment of the body; and in the absence of the spine at the articulation of the third joint of the second pair of antennæ.

64. *Arcturus Murdochii*, Benedict.

Arcturus Murdochii, Benedict, Proc. Biol. Soc. Washington, xii. 1898, pp. 49, 50.

Hab. Point Franklin, Alaska.

65. *Arcturus glaber* *, Benedict.

Arcturus glaber, Benedict, Proc. Biol. Soc. Washington, xii. 1898, p. 46.

Hab. Bering Sea.

* *glaber* by error.

[To be continued.]

XXVII.—*Descriptions of new Neotropical Mammals.*
By OLDFIELD THOMAS.

Tylomys miræ, sp. n.

Slightly larger than any of the other species. Fur close and thick, the hairs about 20–23 millim. in length on the back. General colour above dark cinereous grey, with a slight tinge of fawn; sides more grey and less fawn. Head like body, area round eyes not darker. Ears apparently rather small, naked, grey. Under surface white throughout, the line of demarcation not very sharply defined; on the belly the white narrows, and some of the hairs have a slight greyish tinge at their bases. Arms grey externally, white internally; legs grey nearly all round, but with a narrow line of white running down to the ankles; upper surface of hands and feet chocolate-brown, the terminal phalanges of digits and hairs at the bases of the claws white. Terminal half of tail white, the junction of the dark and white fairly abrupt all round, little mottled.

Nasals narrow, pointed posteriorly, scarcely surpassed by the premaxillæ; supraorbital ridges with a definite postorbital angle, from which point they run nearly straight backwards to the outer corners of the interparietal, and are but little curved outwards in the parietal region.

Dimensions of the type (an adult male, measured by collector in the flesh):—

Head and body 230 millim.; tail 266; hind foot (s. u.) 41; ear 28.

Skull: greatest length 54; basilar length from henselion 42·5; greatest breadth 28; nasals, length 19; interorbital breadth 11; breadth across most distant points of parietal ridges (at postorbital processes) 20; palate length from henselion 22·2; diastema 15; length of upper molar series (teeth much worn) 8·8.

Hab. Paramba, River Mira, N. Ecuador, altitude 1100 m.

Type B.M. no. 99. 8. 25. 1. Collected by R. Miketta, 27th April, 1898.

Three specimens examined, of which the first (an immature female) was collected by Mr. W. F. H. Rosenberg on March 4, 1897, also at Paramba.

Tylomys Watsoni, sp. n.

Size medium. Fur straight and glossy, about 15 millim. long on the back. General colour above, both on head and

back, dull rufous fawn, finely lined with blackish; muzzle, cheeks, and sides greyer and paler. Region between eye and ear blackish. Ears large, naked, grey. Underside of neck, throat, chest, and inner sides of fore limbs white; belly and inner sides of hind limbs dirty whitish buff, the hairs grey basally, whitish terminally. Metapodials brown above, but their inner edges and the whole of the digits white. Tail dark for its basal and white for its distal half, but the junction of the colours is very irregularly mottled, the dark mottling extending above towards the end, while the white extends below more towards the base of the tail.

Skull broad and heavy, much broader and heavier than in *T. panamensis*. Nasals almost parallel-sided, square-ended posteriorly, decidedly surpassed by the premaxillæ; supra-orbital ridges well-developed, diverging evenly and broadly outwards, without postorbital projection, the parietal portion strongly convex outwards, so that the broadest place on the ridges is just behind the zygomatic root instead of in front of it.

Dimensions of the type (an adult female, measured by collector in the flesh):—

(Total length 493 millim.*) Head and body 250; tail 243; hind foot s. u. 35, c. u. 38*.

Skull: greatest length 54; basilar length from hen-selion 42·5; greatest breadth 26·5; nasals, length 18; inter-orbital breadth 10·5; breadth across most distant points of parietal ridges (near middle of parietal) 20·5; palate length from henselion 22·2; diastema 15·3; length of upper molar series 8·4.

Hab. Bogava, Chiriqui, N.W. Panama, alt. 250 m.

Type collected Sept. 6, 1898, by H. J. Watson. Original number 7. Two specimens examined, adult and young. "Caught on banks of river."

This handsome *Tylomys* is most nearly allied to the Guatemalan *T. nudicaudatus*, Pet., but is more rufous, its posterior belly is not white, but soiled greyish, its muzzle and nasal bones are longer and broader, and its parietal ridges are more uniformly and widely bowed outwards.

* As a step towards a greater uniformity in measuring I propose, in agreement with certain of the American zoologists, to record "total length" and the *cum ungue* hind-foot measure for all animals described north of the Isthmus of Panama, while they for their part will give "head and body" and the *sine ungue* foot measure for animals described from beyond North-American limits.

Oryzomys indefessus, sp. n.

Size of *O. galapagoensis*, tail much shorter. Skull markedly different. Fur coarse and shaggy. General colour above dull mouse-grey, heavily lined with black; a slight tinge of fawn in the posterior dorsal region. Face slightly paler than back, no darker markings round eyes. Ears of medium size; a well-marked basal projection on their anterior edge, greyish, the anterior half of their outer surfaces blackish. Under surface greyish white, the hairs everywhere slaty basally, with white tips; line of demarcation on sides not sharply defined. Upper surface of hands and feet white. Tail scarcely longer than the body without the head, well-haired, black above, white below and at the extreme tip.

Skull, as compared to that of *O. galapagoensis*, with a markedly longer and narrower muzzle and with a much narrower interorbital region, the sides of which are evenly concave instead of divergent, so that the least interorbital breadth is at the junction of the olfactory and cerebral chambers, instead of considerably in front of that point. Palatal foramina reaching to the first lamina of *m*.¹. Palate extending some way behind *m*.².

Dimensions of the type (an adult, measured in skin):—

Head and body 135 millim.; tail 97; hind foot (wet) s. u. 30, c. u. 31.5; ear (dry) 18.

Skull: greatest length 35.3; basilar length from henselion 26.5; greatest breadth 18; nasals 14.5×3.6 ; interorbital breadth 4.3; interparietal 2.9×10 ; palate length from henselion 15; diastema 9; palatal foramina 6.5×2.4 ; length of upper molar series 5.3.

Hab. Indefatigable Island, Galapagos.

Type B.M. no. 99. 8. 28. 1. Collected Aug. 31, 1897, by Messrs. Webster and Harris. Two specimens examined.

This is the third *Oryzomys* described from the Galapagos Archipelago, the first being the original "*Mus galapagoensis*" of Waterhouse*, from which it differs as above mentioned, and the second being *O. Bauri*, Allen†, a species with an even longer tail than *O. galapagoensis*. A bat of the genus *Atalapha* is the only other indigenous mammalian inhabitant of the islands.

Reithrodon fossor, sp. n.

Precisely similar in external appearance to *Akodon macronyx*. Fur soft, about 10 millim. long on the back.

* Zool. Voy. 'Beagle,' Mamm. p. 65 (1839).

† Bull. Am. Mus. iv. p. 48 (1892).

General colour above soft fawn-grey, uniform on head and back. Under surface greyish white, fairly well defined, the basal two thirds slaty, the tips dull white. Ears short, about as in ordinary *Akodons*, their hairs coloured like the back. Upper surface of hands and feet white; pollex with a stout claw; other fingers with long powerful claws quite similar to those of *Akodon megalonyx* and *macronyx* and quite unlike the feeble claws of the other *Reithrodons*; claws on toes large, but far smaller than those on fingers; fifth hind toe, without claw, reaching to the middle of the first phalanx of the fourth. Tail about half as long as the trunk, well-haired, pale fawn above, white on the sides and below.

Skull, though larger and heavier, on the whole most nearly allied to that of *R. chinchilloides*, the type of the "*Euneomys*" section of the genus. Nasals decidedly expanded anteriorly, just surpassing the premaxillæ posteriorly; supraorbital edges square, not ridged, their anterior end marked by a slight projection, like, though too far forward to be, a rudimentary postorbital process; fronto-parietal suture evenly curved; interparietal broad, its anterior edge slightly concave forwards; anterior zygoma-root almost as in *R. chinchilloides*, but with a slight concavity on its front edge where the deep undercutting occurs in the other species; palatal foramina widely open anteriorly, reaching back to the level of the front of *m.*¹; palate ending just behind *m.*³; pterygoid fossæ shallow.

Incisors, both upper and lower, very broad, the grooves on the former well defined. Molars broad and powerful.

Dimensions of the type (an adult specimen, measured in skin):—

Head and body 119 millim.; tail 53; hind foot (wet) s. u. 22, c. u. 25; longest fore claw (above) 6·3.

Skull: greatest length 35; basilar length from hen-selion 29; greatest breadth 20·5; nasals 16×6; interorbital breadth 4·4, interparietal 3·1×10·5; palate length from henselion 17; diastema 10; anterior palatine foramina 8·5; length of upper molar series 6·5.

Hab. Salta Province, N. Argentina.

Type B.M. no. 99. 2. 22. 25*. Presented by the La Plata Museum through Dr. F. P. Moreno.

This most interesting new form bears to the other *Reithrodons* precisely the relation that *Akodon megalonyx* and *macronyx* do to the other *Akodons*, being similarly more

* The skull should be taken as the type if it were hereafter shown not to belong to the skin; but it was extracted in the Museum on arrival, so that any mistake seems quite impossible.

highly specialized, by the great development of its claws, for a fossorial life.

Moreover, its external resemblance to *A. macronyx*, inhabiting the same districts, amounts practically to identity, there being absolutely no single character, of size, proportions, or colour, which would make the keenest-eyed "splitter" suppose that the skin of *R. fossor* did not belong to *Akodon*, though in the skull the difference is complete. We have therefore here the striking phenomenon of a large genus like *Akodon* with a few specialized fossorial species, and another smaller genus, with its similarly fossorial species exactly mimicking the corresponding species of the larger group. No doubt the resemblance is not true mimicry in the technical sense, being presumably due to identity of life and local conditions, but it is very striking nevertheless.

In this connexion attention may be called to the resemblance of *Reithrodon Alstoni* to *Sigmodon*, mentioned in the original description of the former*, a resemblance so close as again almost to amount to identity so far as external appearance is concerned.

Echimy's decumanus, sp. n.

Size medium. Spines practically confined to the dorsal surface, the fur on the sides being only hispid, not spinous; strongest spines of back about 20-25 millim. in length and 0·6-0·8 millim. in breadth; greyish white basally, black terminally. General colour above coarsely grizzled sandy fawn, not unlike that of bright pale-coloured specimens of *Mus decumanus*, greyer anteriorly, more fawn-coloured posteriorly. Spinous area along back rather darker, owing to the black tips of the spines, sides paler and greyer. Face grizzled grey, with less tinge of fawn than the back; patch between eye and ear brownish grey. Underside and inner sides of forearms and hips pure white, the hairs white to their bases; upper surface of hands and feet also white or with a slight wash of greyish fawn. Tail uniformly thinly haired, the hairs not hiding the scales, not tufted or pencilled, black above and white below.

Nasals surpassing premaxillæ by about one sixth of their length; supraorbital edges less heavily ridged than in some of the allied species; posterior extension of ridges interrupted on parietals; sides of anterior palatine foramina markedly convex outwards; pterygoids much twisted, narrower and

* P. Z. S. 1880, p. 603.

less spatulate than in *E. semispinosus*; bullæ much swollen, considerably larger than in the latter species.

Dimensions of the type (an adult female, measured by collector in the flesh):—

Head and body 235 millim.; tail 153; hind foot (s. u.) 48; (ear of another specimen 27).

Skull: greatest length 56; basal length 47; basilar length to henselion 40·2; zygomatic breadth 28; nasals 20·5 × 6·3; interorbital breadth 11·7; greatest spread of parietal ridges 21; palate length from henselion 19·2; diastema 11·4; length of upper molar series 9·5.

Hab. Chongon, Guayas Province, west of Guayaquil, Ecuador.

Type B.M. no. 99. 8. 1. 48. Original number 66. Collected 21st November, 1898, by Mr. P. O. Simons. Five specimens obtained.

This *Echimys* is closely allied to *E. semispinosus*, Tomes (the original specimens of which seem to have been discoloured by spirit), but may be distinguished by its shorter nasals, less heavily ridged supraorbital and parietal regions, narrower pterygoids, and larger bullæ.

Coendou quichua, sp. n.

Similar in general characters to *C. bicolor*, Tschudi*, but smaller and with much shorter spines, which are mostly white-tipped.

General covering mainly spinous, but not, as in *C. bicolor*, entirely so, as there are on the upper surface a number of fine black hairs intermixed with the spines, and of about the same length as the latter. Spines of upper surface about 35–50 millim. in length, longer, as usual, along the centre of the back, shorter elsewhere; the diameter of the thickest about 1·2 to 1·4 millim.; in colour they are pale whitish yellow for from one half to two thirds their length, then black, with the terminal 3–5 millim. white, the white giving a markedly speckled appearance to the whole animal, although on the posterior back some of the spines are wholly black-ended. Under surface entirely spinous, the spines being flattened, about 20–30 millim. in length and about $\frac{1}{2}$ millim. or even less in breadth; white basally, then black with a long whitish hair-like end. Muzzle dark brown; whiskers

* Faun. Peruana, Mamm. p. 186, pl. xiv. (1845). I use Tschudi's name for the present, as the identification of the Peruvian species with *C. nycthemera*, Kuhl (Beitr. Zool. p. 71, 1820)—insufficiently described and without locality—seems too uncertain to be accepted.

black; tuft of hair behind ears pale or reddish brown; up-
surface of hands and feet black. Tail rather more than half
the length of the head and body, its basal third above with
variegated spines as on the back, its under surface and middle
third above with close black bristles about $\frac{1}{2}$ inch in length;
its terminal third above naked.

Skull with rather a longer muzzle and larger teeth than
that of *C. villosus*. Nasals parallel-sided, evenly rounded
behind.

Dimensions (taken from a re-made skin):—

Head and body 380 millim.; tail 235; hind foot (s. u.) 58.

Skull: greatest length 81; basilar length from hen-
selson 70; greatest breadth 46.6; nasals 27.2×14.5 ; inter-
orbital breadth 26.4; palate length from henselson 36.5;
diastema 22.4; length of upper molar series 18.5.

Hab. Puenbo, Upper Gualabamba River, Province of
Pichincha, Ecuador; altitude about 2500 metres.

Type B.M. no. 99.2.18.17. Killed June 1898. "Found
in the bushes."

Three specimens of this distinct porcupine have been
presented to the British Museum by Consul L. Süderström,
of Quito, to whom we already owe so much of our knowledge
of the fauna of that interesting region.

Coendou vestitus, sp. n.

A dark-coloured thickly furred species of very small size.
Spines of two sorts.

Size very small, smaller than in any other species except
C. pallidus, Waterh. Fur very long, soft and thick, far
surpassing and hiding the ordinary spines, though in turn
surpassed by the long bristle-like ends of the thinner spines.
On the head, however, the spines show through the fur.
Under surface also thickly furry, without admixture of spines.

Spines, when of normal character, short, the longest
scarcely more than an inch in length and about 1.2 millim. in
diameter; in colour they are white or pale yellowish white,
with their extreme tips (1-2 millim.) black. Mixed with the
normal spines are a number of exceedingly long slender spines
of a different character, less than half a millimetre in thick-
ness, and tapering off into bristles, which considerably surpass
the general body-fur in length and attain a length of 70 millim.
or more. The colour of these slender spines is pale yellow
for their basal inch, the remainder being black.

Colour of the fur in general blackish brown throughout,
above and below, but the specimen is somewhat faded and

may originally have been quite black. The bases of the hairs, however, are paler dull brownish white. Upper surface of hands and feet dark brown. Tail less than half the length of the head and body, its basal half above like the body, the remainder with stiff black bristles.

Skull small, delicate; zygomata slender; nasals surpassing premaxillæ by only about a fifth of their length; no sharply defined ridges on anterior palate.

Dimensions (approximate, taken on dried skin):—

Head and body 290 millim.; tail 130; hind foot (s. u.) 48.

Skull: tip of nasals to bregma (middle of coronal suture) 36; greatest breadth 40·5; nasals $18\cdot8 \times 10\cdot5$; distance between outer corners of infraorbital foramina 23·5; palate length from henselion 26; diastema 14·8; length of upper molar series (*mp.*⁴, *ms.*¹⁻³) 15.

Hab. Colombia.

Type B.M. no. 54. 6. 26. 1. Purchased of Parzudaki in 1854.

This curious little *Coendou* may be readily distinguished from all other species by its small size, thick fur, uniformly dark colour, and by the presence of the peculiar long slender spines in addition to the normal short ones.

The only known species as small as *C. vestitus* is Waterhouse's *C. pallidus*, of which it might have been thought that this was the non-albinistic form; but a comparison of the skulls shows so much difference as to preclude this possibility, nor has *C. pallidus* more than the normal simple spines.

The type of *C. vestitus* is still rather young, as its pre-molars have not changed; but its last molars are fully up and in use, and it has evidently reached its full size.

Metachirus opossum melanurus, subsp. n.

Similar in all respects to ordinary Central-American examples of *M. opossum*, but the tail black to the tip.

Dimensions of the type (an adult male, measured in the flesh):—

Head and body 266 millim.; tail 257; hind foot 41; ear 30.

Skull: basal length 67; greatest breadth 38; combined length of *ms.*¹⁻³ 11·1.

Hab. Paramba, Rio Mira, N. Ecuador; alt. 1100 m.

Type B.M. no. 97. 11. 7. 61. Collected April 11, 1897, by Mr. W. F. H. Rosenberg. Five specimens examined.

All the specimens of the Quica opossum either in the *Ann. & Mag. N. Hist. Ser. 7. Vol. iv.* 20

Museum collection or as recorded by various authors from all the localities of its wide range have from 2 to 4 inches of the end of the tail white, contrasting markedly with the black of the rest of the tail; but in four specimens from Paramba and one from Cachavi the tail is wholly black, a difference which, slight as it is, seems to entitle the N. Ecuadorean form to a special subspecific name.

Philander laniger pallidus, subsp. n.

Essential characters of *Ph. l. derbianus*, but much paler and the colour-markings nearly or quite obsolete.

General colour pale grey throughout, extreme examples being almost white all over, but in other specimens the shoulders, sides of neck, and the middle dorsal region are pale rufous, with an indistinct trace of the grey stripe of *Ph. l. derbianus*. Face pale brownish white, the mesial line scarcely perceptible; area below ears whiter. Forearms, scapular region, and sides of hips very pale grey, nearly white; hind limbs also whitish or with a faint trace of the rufous so conspicuous in *Ph. l. derbianus*. Fur of tail whitish grey, not browner terminally; naked part only slightly mottled with dark just close to the furry part.

Dimensions of the type (an old male, measured in the flesh by collector):—

Total length 587 millim.; head and body 289; tail 308; hind foot, s. u. 43, c. u. 45; ear 32.

Skull: greatest length 61; greatest breadth 35; combined lengths of *ms.*¹⁻³ 9.

Hab. Bogava, Chiriqui, N.W. Panama; alt. 250 m.

Type collected by Mr. H. J. Watson, October 12, 1898. Six specimens examined, besides one obtained at Santa Ana, Costa Rica, by Mr. C. F. Underwood, in May 1895, and another at S. José in 1896.

This appears to be a pale inornate race of the ordinary brightly marked *Ph. l. derbianus* of Central America.

Philander laniger guayanus, subsp. n.

General colour pale whitish, broadly washed with ferruginous, markings nearly obsolete. Face dull white, mesial stripe scarcely perceptible. Neck and back uniform pale rusty, the hairs dull whitish subterminally, their tips bright rusty, richest in the centre of the back; a very faint indication of the grey stripe on withers. Sides similar to back, but paler, and the underside also faintly washed with rusty. Arms and legs like back, hands and feet paler. Furry part

of tail dull pale rusty above, paler below; first two or three inches of naked part mottled with brown, the rest white.

Dimensions of type (male):—

Hind foot (wet) 44 millim.

Skull: greatest length 60; basal length 56; greatest breadth 35; combined length of *ms.*¹⁻³ 8.3.

Hab. Balzai Mountains, Prov. Guayas, W. Ecuador.

Type B.M. no. 80. 5. 6. 87. Coll. Illingworth. Two specimens.

The uniform pale reddish colour of these specimens is quite peculiar, but there is sufficient resemblance to it in some of the other Museum Philandei to prevent my making the Guayas form into a full species.

Marmosa Simonsi, sp. n.

A grey medium-sized species with a white tail-tip.

General appearance very like that of *M. sinlawi*, Allen, although very much larger. Colour above soft pale mouse-grey, clearer on the fore back, becoming rather buffy posteriorly. Centre of face pale yellowish white; dark eye-markings broad, strong, black, extending quite to the ears. Lower cheeks, patch behind base of ears, and whole of under surface pale buffy yellow, the hairs on cheeks and chin this colour to their roots, those on the belly slaty basally. A well-marked chest-gland present. Arms and legs like body; hands and feet silvery white above. Tail clothed with body-fur for rather less than half an inch, then practically naked, grey for its basal three fifths or two thirds, white terminally, as in most of the larger species, the two colours more or less mottled at their junction and below.

Skull of about normal proportions; nasals well expanded posteriorly; supraorbital edges with well-defined ridges and pointed postorbital processes; middle and posterior premolars about equal in size.

Dimensions of the type (an adult female, measured by collector in the flesh):—

Head and body 130 millim.; tail 152; hind foot (s. u.) 20; ear 26.

Skull: greatest length 34; basal length 30.5; nasals 14.1 x 4.4; interorbital breadth 5.1; intertemporal breadth 6.4; palate length from gnathion 18.2; breadth between outer corners of *m.*⁹ 11; combined length of *ms.*¹⁻³ 6.

Hab. Puná, Puná Island, and Guayaquil; altitude little above sea-level.

Type B.M. 99. 8. 1. 20, from Puná. Original number 9. Collected 3rd November, 1898, by Mr. Perry O. Simons.

The specimens from the mainland near Guayaquil do not appear to differ at all from those obtained on Panamá Island.

This *Marmosa* has some resemblance to Tomes's *M. Waterhousei*, but that is said to have a pouch in the female and came from the eastern side of the Andes at Gualaquiza.

I have named this pretty opossum, the first-fruit of Mr. Simons's Ecuadorean trip, in his honour, in recognition of the collecting powers he has shown both in Mexico (where he obtained a number of new mammals described by Dr. Allen and myself) and now in Ecuador.

XXVIII.—*Notes on Montagu's Hunting-ground, Salcombe Bay.* By the Rev. Canon A. M. NORMAN, M.A., D.C.L., LL.D., F.R.S., &c.

[Plate V. figs. 1, 1 a.]

Pereionotus testudo (Montagu). (Pl. V. figs. 1, 1 a.)

1808. *Oniscus testudo*, Montagu, Trans. Linn. Soc. vol. ix. p. 102, pl. v. fig. 5.

1862. *Pereionotus testudo*, Bate & Westwood, Brit. Sessile-eyed Crust. vol. i. p. 228.

1862. *Pereionotus testudo*, Bate, Cat. Amphip. Crust. in Brit. Mus. p. 375.

1864. *Ieridium fuscum*, Grube, "Beschr. einiger Amphipoden der Istrichen Fauna," Arch. f. Naturg. 30 Jahrg. p. 209, pl. v. fig. 3 a-f.

1893. *Pereionotus testudo*, Della Valle, Faun. und Flor. des Golfes von Neapel, (Gammarini, p. 559), pl. iii. fig. 7, pl. xxxi. figs. 1-19 r.

1899. *Pereionotus testudo*, Stebbing, "Amphipoda from the Copenhagen Museum and other sources," Trans. Linn. Soc., Zool. ser. 2, vol. vii. p. 417.

Pereionotus testudo is a very remarkable Amphipod, with the metasome (or pleon) much reduced in proportion to the mesosome (or peræon), and, moreover, the epimera are outspread and horizontal instead of, as usual, nearly vertical; the whole form is thus depressed instead of compressed as in ordinary Amphipoda, and it is not therefore to be wondered at that Montagu assigned it to *Oniscus* and not to *Gammarus*.

Montagu procured his type at Salcombe, and when Bate and Westwood were publishing their work this type was fortunately found to be in the British Museum. From it their figures were taken, and are very characteristic drawings considering that they were made from a specimen which had been preserved dry for fifty-four years.

As yet the species has not been met with in any other part

of the British coast; but I now record a second example. In 1875 I went to Salcombe for the express purpose of trying to rediscover some of Montagu's species, and was fortunate enough to obtain a single example of this Amphipod where our old British naturalist had procured it sixty-seven years before. Shortly after I had found the *Pereionotus* the Rev. T. R. R. Stebbing kindly made for me the figures which I here publish.

The species has been described as *Ieridium fuscum* from the Adriatic by Grube, and Della Valle gives excellent figures of it from Neapolitan specimens in his great work; and I am indebted to him for a Mediterranean specimen. Stebbing, in his paper just published, institutes a family Phliadidæ to receive this and four other closely allied genera, and has corrected a mistake of previous writers who supposed that *Pereionotus* had only two pair of uropods by the discovery of the last uropods in a very rudimentary condition underlying and completely concealed by the telson. The genus therefore has first uropods biramous, second uniramous, "third one-jointed, obscure, completely covered by the telson." In the allied *Phlias serratus*, Guérin, from the Mediterranean, the second uropods are two-branched. The other genera of the family have only as yet been found in New Zealand or Australia.

Callianassa subterranea (Montagu).

This is another of Montagu's Salcombe discoveries, and on a specimen of it he found the Isopod parasite *Ione thoracica* (Mont.). This parasite I was most anxious to procure, as at that time it had not again been met with in our fauna*. Unfortunately I did not find *Callianassa*; but by digging at the sides of the pools in the salt-marsh on the eastern side of the estuary *Gebia stellata* (Montagu) (= *G. deltura*, Leach) was procured accompanied in its burrows by the mollusk *Lepton squamosum* (see Ann. & Mag. Nat. Hist. ser. 6, vol. vii. 1891, pp. 276 & 388).

OPHIUROIDEA.

Ophiocnida brachiata (Montagu), = *Ophiocoma brachiata*, Forbes, = *Amphiura neapolitana*, M. Sars, = *Ophiocnida brachiata*, Lyman.

This starfish was another of the discoveries of Montagu at Salcombe, and was rediscovered there by me on the visit

* *Ione* has since been found on *Callianassa* at Jersey by Messrs. Sinal and Hornell, and it is not rare at Naples.

referred to. On the eastern side of the harbour at spring-tides a patch of fine sand is laid bare; here, while the water still covers the sand, the tips of the long arms of *Ophiocnida* were seen waving to and fro in the water, and the use of a spade enabled me to procure a good supply of specimens.

I may add that *Pinna rudis* (Linn.), the largest of our British shells, lives between tide-marks at Salcombe, and that the dredge worked in the bed of the estuary, over which there is a strong tideway, which sweeps all small material away, brings up dead shells of *Pecten maximus* and other bivalves, pieces of crockery, &c., which afford the student of the Polyzoa a very rich harvest of encrusting species.

EXPLANATION OF PLATE V. FIGS. 1, 1 a.

Fig. 1. *Pereimotus testudo*, seen from above.

Fig. 1 a. Ditto, seen from the side.

XXIX.—*Jæropsis Dollfusi*, a new Mediterranean Isopod.

By the Rev. Canon A. M. NORMAN, M.A., D.C.L., LL.D., F.R.S., &c.

[Plate V. figs 2-8.]

IN 1885 Dr. R. Kœhler described an interesting new genus of Isopoda allied to *Jæra*, which he had discovered in the Gouliot Caves of the Island of Sark. To this Isopod he gave the name *Jæropsis brevicornis* (Ann. des Sci. Nat., Zool. 6^e sér. vol. xix. p. 1, pl. i. figs. 1-9).

I have just received from the Smithsonian Institute of Washington a paper ("Key to the Isopods of the Pacific Coast of North America, with Descriptions of Twenty-two new Species," by Harriet Richardson, Proc. U.S. Nat. Mus. vol. xxi. 1899; reprinted in the current volume of the 'Annals'), in which, at p. 860, is described and illustrated with woodcuts (figs. 31-33) another and very closely allied species of this genus, *Jæropsis lobata*, H. Richardson. Two specimens of this form were procured in Monterey Bay, California, by Mr. Heath.

The object of the present paper is to make known a third species of *Jæropsis* which I procured at Naples when working at the Zool. Stat. in 1887.

Fam. Janiridæ.

Genus *JÆROPSIS*, K  hler.*Jæropsis Dollfusi*, sp. n. (Pl. V. figs. 2-8.)

There is a marked similarity in the three species of this genus which are now known as regards the general outline of the body, and especially the structure of the mesosomes, which are distinctly separated from each other, as also in the general character of the antennules and antennæ. In the present species the prosome or cephalon is subquadrate, the length and breadth being subequal; the anterior margin is emarginate, and in front of this the buccal organs are conspicuously projected; the lateral margins are slightly convex opposite to the eyes, which are situated at some distance from the frontal margin. The metasome (or pleon) is semielliptic, narrowing from the base to the extremity, where the small uropods are attached; each lateral margin is serrated, the serrations being eight in number.

The antennules (Pl. V. fig. 3) have the basal joint expanded, the length and breadth subequal; the distal portion of the outer margin is cut into several spine like processes, and the extremity of the inner margin has also two projecting points; the second joint is of about the same length as the first, but is much narrower, it slightly widens towards the extremity; the last joint of the peduncle is again much narrower than the second and much shorter; the flagellum is composed of only two articulations, the first of which is much shorter than the terminal long joint.

The antennæ (fig. 4) have the first three joints very short; the fourth, which is the first of those represented in the figure, is very large and wide, with the outer margin expanded and remarkably crenulated; the last two joints of the peduncle are also large and massive, the last, which is longer than the penultimate, gradually tapers to the extremity to receive the small flagellum, which does not equal half its length and is composed of four or five articulations.

The legs are of nearly similar general structure to those of the genus *Jæra*, and end in two nails of equal length.

The uropods (fig. 7) are minute and terminate in two lobes, of which the outer is furnished with a bunch of setæ and the inner ends in a strong curved nail.

Length 3.25 millim.

Found in material dredged near the island of Capri in the Bay of Naples.

The present species is distinguished from those previously described in the form of the cephalon and structure of the metasome, in the remarkable structure of the fourth joint of the antennæ, and the details of the uropods.

I have named the species after my friend M. A. Dollfus, who has done such excellent work among the Isopoda. I am indebted to the kindness of the Rev. Arthur Cole for the illustrations in the Plate.

EXPLANATION OF PLATE V. Figs. 2-8.

Fig. 2. Female, magnified. The natural length is shown by the side of fig. 2.

Fig. 3. An antennule.

Fig. 4. One of the antennæ; the three short basal joints of the peduncle are omitted.

Fig. 5. One of the maxillipeds.

Fig. 6. Inner member of the first pleopod of the male.

Fig. 7. Right uropod.

Fig. 8. A peræopod.

XXX.—On *Myodes lemmus crassidens*, var. nov. foss., from Portugal*. By Professor A. NEHRING.

In the year 1896 Barrett-Hamilton published in the 'Proceedings' of the Zoological Society of London, pp. 304-306, an interesting communication on the remains of lemmings from a cave which is situated at Athougua, Portugal, not far from Santarem, in the province of Estremadura.

As the remains of lemmings which I have myself dug up and even examined amount to thousands, I was consequently extremely desirous of seeing the Portuguese lemming-remains; through the kind offices of Mr. Barrett-Hamilton in London and Dr. Harmer in Cambridge I went to the Zoological Museum of the University of Cambridge, so that I am able to speak from personal observation†. Secondly, owing to a letter from Dr. Gadow, I had the welcome opportunity given me of making some more exact observations on the discovery.

I examined the remains of six examples, which were represented by five crania (of which four had the corresponding lower jaw), several half mandibles, as well as a number of

* Translated from the 'Archiv für Naturgeschichte,' vol. i. part 2 (1899), pp. 175-182, by Wilfred Mark Webb, F.L.S.

† I have already published a short preliminary notice of these Portuguese lemming-remains in the 'Sitzungsbericht d. Berl. Ges. natürl. Freunde' of March 21, 1899.

vertebrae and bones of the extremities, &c. These objects were found by Dr. H. Gadow in 1886 at the back of a perfectly dry cave at Athouguia, not far from Santarem. The celebrated explorer wrote to me under the date of the 21st of February, 1899, as follows:—

“The cave in question is situated on very hard Jurassic limestone, about 50 to 100 feet above the bottom of a valley watercourse, which is dry, except in winter and in the rainy season: it runs horizontally into the mountain.

“The cave in which the lemmings were found contains a great quantity of quite dry reddish dust, and only on the surface of the layer of dust was there a thin crust of a more solid clayey nature that has arisen when the earth was somewhat hygroscopic during the wet season of the year. The cave was nearly full of dusty earth several feet deep. In this dust I found the (lemming) mummies, never on the bed-rock itself. Moreover, I found scattered bones rather near the surface, among others the half maxilla of a very young bear, in fact a suckling. On the surface at the back of the cave lay bones of bats and some small bird-remains.

“Quite near the entrance of the cave, but embedded in the dust at a depth of some inches, I found a small flint arrow-head, not polished but chipped. The bear's maxilla is (or was) brown, pointing to its youthful condition: very porous.”

Dr. Gadow went on to say that no mystery or error as to the original locality of the lemming-remains could exist. He had himself discovered the cave in question, which was situated in a most inhospitable region, and besides his own workmen no one knew anything of his actions or intentions.

Hence there can be no doubt as to the situation of the objects under consideration, neither also can the fact that they belong to the genus *Myodes*, nor their near relationship to the common Scandinavian species, be questioned. I have had a fine set of material at hand for comparison—to wit, ten skulls of *Myodes lemmus*, three skulls of *Myodes schisticolor*, three skulls of *Myodes obensis*, four skulls of *Myodes (Cuniculus) torquatus*, four skulls of *Myodes lagurus*, &c., as well as numerous fossil remains (mostly jaws) of *Myodes lemmus* resp. *obensis* and *M. torquatus*. The result of the comparison which I made is that I can confirm in every way the points of osteological agreement already advanced by Barrett-Hamilton between the above-mentioned Portuguese lemmings and *Myodes lemmus*. The only noteworthy differences that I have found in the case of the skull and teeth consist in a somewhat broader form of the *processus*

coronoideus of the under jaw and the greater breadth of the cheek-teeth. Some slight differences also appear to exist in the bones of the extremities.

As is well known, *Myodes lemmus*, L., *M. schisticolor*, Lilljeb., and *M. obensis*, Brts., form a group of species of lemmings which almost exactly agree one with another in the shape of the cheek-teeth. They can be placed together under the generic name of *Lemmus*, Link. Especially characteristic of them is the shape of the third lower molar (*m. 3 inf.*): the latter shows four distinctly separate prisms on the masticatory surfaces, while in *M. torquatus* there are five distinct prisms, and the species of *Arvicola* and *Microtus* have only three * left. The remaining cheek-teeth also in the species of lemmings have such a characteristic shape that an expert can instantly determine them as belonging to *Lemmus*. This refers particularly to the last upper molar (*m. 3 sup.*), as well as to the relationship of the outer and inner enamel prisms one to another in *m. 1* and *m. 2 sup.* The masticatory surfaces of the lemming's teeth seen in figure 1 may be compared with those of *Arvicola* given in figure 2. I have placed the two side by side for purposes of comparison.

A distinguishing feature of the lemmings may be seen in the length and position of the socket of the lower incisor. This socket runs along the inner wall of the under jaw, near the sockets of *m. 1* and *m. 2*, and ends before reaching that of *m. 3*. In the genus *Arvicola* it extends from the inner side of the jaw, slopes under *m. 2* towards the outer wall of the same, and rises a considerable distance into the articulation process (*condylar process*) above, the end of the socket being marked on the outside by a sort of knob†. *Myodes torquatus* shows almost exactly the same form in the socket of the lower incisor as in the species of *Lemmus*, but this runs back past the first, still nearer to *m. 3*, and is thus somewhat longer.

Very characteristic of *Myodes lemmus*, *M. obensis*, and *M. schisticolor* is the relatively broad flat form of the skull, with which a well-marked projection of the jugal is combined (see fig. 3). It is only necessary to place the skull of one of

* See my detailed paper on "Fossil Lemmings and *Arvicola*" in Giebel's 'Zeitschr. f. d. Naturwiss.' 1875, vol. xlv. pp. 1-28, pl. 1. Here the differences occurring in the construction of the cheek-teeth of *M. lemmus*, *M. torquatus*, and the largest of the species of *Arvicola* are described. Compare also my paper on the "Smaller Vertebrates of Schweizersbild, near Schaffhausen," reprinted from the 'Denkschr. d. Schweiz. naturf. Ges.' vol. xxxviii. p. 23 *et seq.*

† Compare my account, *op. cit.* p. 23.

these lemmings beside that of an *Arvicola amphibius* or *A. rattiiceps* in order to appreciate the great difference.

Fig 1

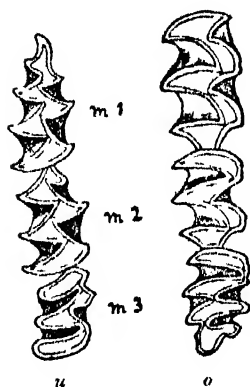


Fig 2

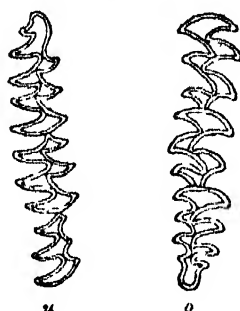


Fig 1 —The masticatory surfaces of the cheek-teeth of *Myodes lemmus crassidens* from Portugal, enlarged about 6 times

u Lower row of teeth.

o Upper row of teeth

Fig 2 —The masticatory surfaces of the cheek-teeth of *Arvicola rattiiceps*, K & Bl, from Northern Russia, enlarged 6 times.

u Lower row of teeth.

o. Upper row of teeth

Fig 3



The skull of *Myodes lemmus crassidens*, with the under jaw, from Portugal Natural size.

The differences between the three known species of lemmings lie chiefly in the colour of the fur and in their size. From my

material *Myodes obensis* appears to be the most robust. At least two skulls of this species before me, from Nova Zembla, which I was allowed to prepare from two spirit-specimens in our Natural History Museum*, exceed in size the largest skull of *Myodes lemmus* which I have. Their basal length ("Basilarlänge," Hensel) averages 30.5 mm., their total length (exclusive of the incisors) is 33.3 and 33 mm. respectively, their jugals 24 and 22.8 respectively, and the length of their rows of upper cheek-teeth 8.5 mm. In addition, these skulls are surprisingly thick. A third skull of *M. obensis*, which I have taken from a North-Siberian skin in our collection (at the Berlin Hochschule), is much more elegant, but doubtless belonged to a younger animal †.

According to Lilljeborg ('Sveriges och Norges Ryggradsdjur,' i. Upsala, 1874, p. 325), the normal length of the skull in *M. lemmus* should be 32 mm., and the breadth across the zygomatic arches 22 mm.; but the ten skulls now before me are all smaller, having a total length of from 28 to 30.8 mm., and a breadth of 19 to 21 mm. across the zygomatic arches. A skull, in my own collection, of an old male from Finland, the strongest and most massive of all the skulls of *M. lemmus* at my disposal, has a total length of only 30.8, and a breadth across the zygomatic arches of 21 mm. From this I must conclude that Lilljeborg's skull-measurements for *M. lemmus* do not refer to the average, but to the maximum.

The same appears to be the case with *M. schisticolor*. Lilljeborg (*op. cit.* p. 318) gives the length of skull in this species as 25, and the breadth across the zygomatic arches as 16 mm.; but in the three examples before me, which can in no way be regarded as immature, but are of medium age, the biggest has a length of only 23.7, and a breadth across the zygomatic arches of 14.5 mm. In the two other skulls the total length averages 22.5, and the breadth across the zygomatic arches 14 mm. ‡ The length of the upper rows of cheek-teeth in all three averages about 6.6 mm.

The Portuguese lemming skulls from the cave at Athouguia, which I have before me, as already stated, agree almost exactly with the Scandinavian examples lying

* These specimens (labelled No. 4343), collected by Houglin, were placed in my hands by Herr P. Matschie, by the kind permission of Herr Möbius.

† The skull figured by Middendorff (Sibir. Reise, Säugeth. pl. x.) of an adult *M. obensis* agrees exactly with those before me from Nova Zembla.

‡ Besides this, the skull of *M. schisticolor* differs from that of *M. lemmus* not only in its elegance, but in the more spherical shape of the auditory bulla.

with them. The cheek-teeth only appear to be constantly thicker, and the coronoid process broader than in the latter. On account of the first feature I have already suggested, in the 'Sitzungsberichte der Berlin. Gesellsch. naturf. Freunde' of the 21st of March, 1899, that as the remains in question represent a Portuguese race of the lemming, they should be separated as "*var. crassidens*."

With regard to individual examples, the remains of which were consigned to me in five boxes, I have now to offer the following remarks:—

No. 1 *. Skeleton of a middle-aged example, obtained by soaking one of Gadow's mummied lemmings. Total length of the skull 29.2, basal length ("Basilarlänge," Hensel) 26.2; breadth across zygomatic arches 19.5; upper row of cheek-teeth 8.4, lower 8.2; condylar length of the lower jaw (see fig. 3, *a-c*) 19.5, angular length of the same (fig. 3, *a-b*) 20 mm. Humerus, without the upper epiphysis, 16.1; ulna, without the lower epiphysis, 17.6; radius, without the lower epiphysis, 14; os innominatum 20; femur, without the lower epiphysis, 17.8; tibia, without the upper epiphysis, 23.5 mm.

No. 2 *. Skeleton of another middle-aged example. The above-mentioned epiphyses of the limb-bones remain in place, without, however, becoming fused. This skeleton also has evidently been derived from one of Gadow's mummied lemmings by soaking. Total length of the skull (shown in our fig. 3) 29.2, basal length 26.5; breadth across zygomatic arches 19; upper row of cheek-teeth 8.3, lower 8.0; condylar length of lower jaw 18.8 mm. Humerus, without upper epiphysis, 15.3; femur, with lower epiphysis, 18.3; tibia, with upper epiphysis, 22.8 mm.

No. 3. Cranium with lower jaw, to which a number of parts contained in No. 5 presumably belong. Total length of skull 30, basal length 27.2; breadth across zygomatic arches about 20; upper row of cheek-teeth 8.5, lower 8.3; condylar length 19.5 mm.

No. 4. Cranium without lower jaw; but a pair of lower jaws in box No. 5 evidently belong here. Total length 30, basal length 27; breadth across the zygomatic arches 20; rows of cheek-teeth 8.6 mm.

No. 5. A box containing a badly-preserved cranium, as well as a pair of under jaws; also another pair of under jaws, probably belonging to No. 4, a much damaged half of a

* To be exact, only the principal portions of the skeletons lie before me which are still partly in their natural position, as the dried sinews remain in most cases. See P. Z. S. 1896, p. 304.

right under jaw, the fragments of a cranium, and numerous limb-bones, still united by the ligaments, belonging to three distinct skulls.

Anyone seeing these lemming-remains without knowing their origin would put them down as the recent bones of the common Norwegian species. I have already, in the *Sitzungsberichte der Berl. Ges. naturf. Freunde*, 1899, p. 56, stated that they have not the appearance of fossils. I first of all held the opinion that they were to be looked upon as fossils in the ordinary sense of the word, and to be assigned to the Pleistocene period, while I spoke in the above-mentioned '*Sitzungsberichte*' as to the possibility of a race of lemmings, hitherto unknown, still living in the Portuguese mountains, a possibility to which Barrett-Hamilton (*op. cit.*) had previously alluded. To judge, however, from a letter which the famous zoologist Professor Barboza du Bocage, of Lisbon, most kindly sent in answer to my enquiry, it appears extremely improbable that any such race of lemmings now exists anywhere in Portugal. Indeed, as Barboza du Bocage has pointed out in his letter, up till now no undoubted fossil remains of lemmings have been found in Portugal; but this latter circumstance may easily be explained by the fact that up to the present but little attention has been paid there to the remains of such small animals.

In Germany there are plenty of localities for diluvial animal remains, in which, although excavation has been going on for ten years or more, no traces of lemmings have yet been found or recognized as such—notwithstanding* that many remains of lemmings have been found, as I might mention, for instance, in the quarries at Thiede, near Brunswick, in a number of Upper Franconian caves, and a series of other localities. The mud-deposits of the quarries at Thiede have been known since the time of Leibnitz, on account of their richness in diluvial (pleistocene) animal remains and are often visited by collectors. Yet nobody before me had noticed the remains of lemmings. I myself found in these deposits, between 1874 and 1881, hundreds of undoubted remains (especially lower jaws) not only of *Myodes lemmus* (resp. *obensis*), but also of *Myodes torquatus*. Also I could mention certain caves in Upper Franconia and many other localities in Mid-Europe where I was the first to find the bones of lemmings (see, for example, my "*Uebersicht über 24 mitteleuropäische Quartär-Faunen*," in the *Zeitschr. d. deutschen geolog. Gesellschaft*, 1880, pp. 468–509, and also the '*Zeitschrift*,' "*Gaea*," 1879, pp. 663, 671, and 712–726).

In course of time I have come across some forty localities

for lemming-remains in Central Europe (Germany, Poland, Hungary, Belgium, Switzerland). For other localities in which these remains occur consult Woldrich, W. Blasius, M. Schlosser, and E. T. Newton. It is now certain that *Myodes lemmus* (resp. *obensis*) and *Myodes torquatus* had a wide distribution in Central and Western Europe during the Glacial period. In some localities, as Thiede, for instance, *M. lemmus* is most abundant, in others *M. torquatus*. In other places only one of the two species occurs; for instance, *M. torquatus* is principally found in the hilly parts of South Germany, as well as in Schweizersbild, near Schaffhausen (Switzerland). In my book 'Ueber Tundren und Steppen' (Berlin, 1890), I have given on p. 147 *et seq.* all the known localities for fossil lemming-remains brought up to date, and thoroughly discussed their scientific significance, so that I need not treat the subject here.

In France lemming-remains have, so far as I know, only been found in small numbers; they are known from Auvergne in the case of *M. torquatus*, while *M. lemmus* has been found in Perigord. Gadow's lemming-bones from Portugal point to the conclusion that the region lying between Central Portugal and the district of Perigord was once inhabited by lemmings or touched by them in their migrations. One must otherwise assume that during a certain portion of the Glacial period Portugal was joined to South England, where also fossil lemming-remains are found, by a land-connexion, and obtained its lemmings from there.

In any case, the lemming-remains under consideration are very interesting objects which deserve the attention of zoologists, as well as of palæontologists and geologists.

As I have already said, I would not believe that they belonged to the Pleistocene period (resp. Glacial) when I obtained access to them at Cambridge, because they certainly look like parts of recent skeletons which had been prepared from animals preserved by drying and *afterwards* soaked in water. In accordance with the above-mentioned statement by Prof. Barboza du Bocage, that it can hardly be imagined there is a recent race of lemmings anywhere in Portugal, I have come to the conclusion that we must ascribe the lemming skeletons from the cave at Athougua to the Pleistocene period, in spite of their fresh state of preservation and the portions of the (dried) soft parts still adhering to them.

What the cold of the frozen ground in Siberia has done in preserving the dead bodies of mammoths, the great dryness of the cave has effected for the lemming-remains—to wit, a prevention of putrefaction and consequent preservation of the soft parts. I have a large series of ancient Egyptian

mummied dogs in my possession, which have apparently not been properly embalmed, but only dried, and still they show the soft parts well preserved (though, of course, completely dried up and shrivelled); and on moistening them with water, as I have often done, one obtains a preparation of the skeleton very similar to that which Barrett-Hamilton obtained from the mummied lemmings from the cave in Athouzia. As this cave, from the careful account of Gadow, was absolutely dry and had been so from the time that the dust was deposited, there is no reason why the lemmings should decay. They have been preserved completely, in spite of the length of time during which they have lain in the dust of the cave.

It is to be hoped that the Portuguese palæontologists will shortly find other lemming-remains in their country. The present paper may afford them some incentive in that direction.

XXXI.—On *Thylacomys*, Owen. By T. S. PALMER.

IN 1837 Reid * described the peculiar rabbit-bandicoot of Western Australia, from a specimen taken on Swan River, under the name *Perameles lagotis*. The distinctions between it and previously described species of *Perameles* were so marked that he suggested that the new form might be considered a distinct subgenus under the name *Macrotis*. This name, however, having been previously employed in entomology by Dejean in 1833, was untenable and has never come into general use.

Three years later, in 1840, Blyth † adopted Reid's suggestion, but used *Thylacomys* for the genus on the authority of Owen. Blyth's explanation is as follows:—"Two or three more [bandicoots] have been indicated, one of which, *P. lagotis*, Reid, is ranged by Prof. Owen as THE PHILANDER (*Thylacomys*, Owen). The only known species (*Per. lagotis*, Reid) is a nimble-looking and handsome animal, greyish, and as large as the common opossum."

In 1841 Gray ‡ made *P. lagotis* the type of his subgenus

* Proc. Zool. Soc. London, 1836, no. xlviii. pp. 129-181 (June 27, 1837). Reid states that his specimen came from Van Diemen's Land; but according to Thomas the type specimen in the British Museum is from Swan River, Western Australia.

† Cuvier's 'Animal Kingdom,' 1840, p. 104; 1863, p. 92. I have not seen the original edition of this book, but have examined the reprint of 1849 and the edition of 1863, both of which are practically identical.

‡ J. E. Gray in Gray's Journ. Two Exped. North-west and West Australia, App. II. 1841, p. 401.

Paragalia, variously spelled *Perigalea* (Gray, 1843), *Paragalea* (Gray, 1843), *Peragalea* (Gould, 1845), *Peragale* (Thomas, 1887), and under this name the genus has since been generally known.

Thomas, in referring to the rabbit-bandicoot in his 'Catalogue of Marsupialia and Monotremata in the British Museum,' 1888, says:—"Blyth (Cuv. An. K. p. 104, 1840) states that Prof. Owen had separated off 'The Philander, *Perameles lagotis*,' as a genus under the name of *Thylacomys*. I am, however, quite unable to find any distinction of the genus in Prof. Owen's papers, and therefore retain the well-known name given to the genus by Gray. Blyth's statement was, perhaps, based on a confused account of Gray's *Thylamys elegans* (= *Didelphys elegans*), a member of the group of opossums to which the latter author applied the name of 'Philander'" (pp. 221-222, footnote).

I have also searched for *Thylacomys* in Owen's early papers several times without success, until recently Dr. Chas. W. Richmond called my attention to a paragraph in the London 'Athenæum' which seems to clear up the uncertainty surrounding the name. Late in the year 1838 Owen read his paper "On the Osteology of the Marsupialia" before the Zoological Society of London. A brief report of the meeting of Oct. 9 which appeared in the London 'Athenæum' for Oct. 13, 1838, p. 747, contains the following statement:—"The reading of an elaborate paper, descriptive of the osteology of the *Marsupialia*, was commenced by Mr. Owen, who remarked on the great value of an acquaintance with the structure of the skeleton in determining the genera and species of this group of animals, and proposed the new genus *Thylacomys* for certain species presenting a peculiar conformation of the cranium." Owen's paper was published both in the 'Proceedings of the Zoological Society of London' and in the 'Annals and Magazine of Natural History,' and although in both cases the name is carefully omitted, it is quite certain, on account of the frequent mention of *Perameles lagotis*, that this is the species referred to in the 'Athenæum' report. Although this evidence may seem insufficient to establish the status of *Thylacomys* in 1838, it leaves no question as to the validity of the genus when taken in connexion with Blyth's adoption of the name in 1840 and his unequivocal statement:—"P. *lagotis*, Reid, is ranged by Prof. Owen as the Philander (*Thylacomys*, Owen)."

Thomas's objection that "Blyth's statement was based on a confused account of *Thylamys elegans*" does not seem to be well taken. Owen apparently used *Thylacomys* in reading

his paper before the Zoological Society, but for some reason withdrew the name before his paper appeared in print, and subsequently carefully avoided all reference to it. Under these circumstances it is perhaps better not to hold Owen responsible for *Thylacomys*, but to adopt it on the authority of Blyth, by whom it was published as a perfectly valid name one year prior to the appearance of *Paragalia*, Gray.

Thus, of the three names based on the rabbit-bandicoot (*Perameles lagotis*), *Macrotis* is preoccupied, *Paragalia* or *Peragale* is antedated, and *Thylacomys*, the first tenable name for the genus, should be adopted on the ground of priority.

XXXII.—Notes on the Orthopterous Genus *Phyllophora*.

By W. F. KIRBY, F.L.S., F.E.S.

[Plate VI.]

THE *Phyllophorinæ* are a small subfamily of *Mecopodidæ* distinguished by the prothorax being produced backwards triangularly into a large and more or less pointed hood, always spinose, dentated, or crenulated on the sides.

The number of species described is not large, and I do not at present propose to break up the old genus *Phyllophora*, but only to enumerate the described species, clearing up the synonymy as far as possible and describing some new forms.

It should be noted that most of the species, if not all, are probably green when alive, unless the same species may be either green or brown when living, as is the case in some *Orthoptera*.

Genus *PHYLLOPHORA*.

Phyllophora, Thunb. Mém. Acad. Pétersb. v. pp. 219, 286 (1815).

"*Thorax* rhombeo-planus, marginatus, deflexus, acuminatus. *Hemelytra* elliptico-ovata, deflexa, grandia, nervosa, alas et abdomen tegentia."

Hyperhomala, Serv. Ann. Sci. Nat. xxii. p. 161 (1831).

Hyperomala, Boisd. Voy. Astrolabe, Ent. ii. p. 649 (1835); Serv. Ins. Orth. p. 544 (1839).

The types of all the above names belong to the second section of the genus.

Species not yet represented in the Natural History Museum are marked with an asterisk.

SECTION I.

Spines long and sharp, not numbering more than 20 on each side behind the central spine, which is almost always longer than the others in this genus.

*1. *Phyllophora spinosa*.

Phyllophora spinosa, Brunner von Wattenwyl, Abhandl. senckenb. Ges. xxiv. p. 261, pl. xix. fig. 47 (1898).

Hab. Kaiser Wilhelm's Land, New Guinea.

*2. *Phyllophora truncata*.

Phyllophora truncata, Brunner, Abhandl. senckenb. Ges. xxiv. p. 262, pl. xix. fig. 48 (1898).

Hab. South coast of New Guinea.

3. *Phyllophora aruana*, sp. n. (Pl. VI. fig. 7.)

♀ *Phyllophora speciosa*, Blanch. (nec Thunb.) Voy. Pôle Sud, Zool. iv. p. 303, pl. iii. figs. 1, 2 (1853) (from Triton Bay, New Guinea).

Hab. Aru.

Long. corp. 50 millim., cum app. 59 millim.; exp. tegm. 152 millim., lat. 32 millim.

Male.—Green (type discoloured); front of head slightly waved; hood pointed, with long strong conical spines, gradually diminishing in length hindwards, but without alternately larger and smaller ones; lateral spines much longer than the others; front lobe with 3, middle lobe with 2 teeth; the division between the middle and hind lobe, as well as the central carina of the last, very slightly marked; tegmina gradually widening for three fourths of their length, when the costa bends obliquely, and the inner margin at rather more than a right angle to the apex, which is rounded off; the three terminal branches of the principal nervure separating close together, the upper and second nearly straight, gradually diverging, the lower one bending downwards, and forking just on the upperside of the apex. Front femora with 5–6 spines on the outer carina and 3–4 on the inner; intermediate femora with 5 pairs (the middle spine wanting on the inner carina of the right middle femur); hind femora with 8 or 9 spines (not counting the terminal ones) on the outer carina and 5 on the inner.

This specimen is considerably smaller than Brunner's type of *P. truncata*; but I should not be surprised if it ultimately proves to be the male of that insect. It also much resembles the figure of *P. speciosa*, Blanch. (nec Thunb.).

SECTION II.

A sharp shoulder-spine at the broadest part of the hood, behind which the converging sides are armed with very numerous short spines or blunt teeth, and are sometimes hardly more than crenulated.

4. *Phyllophora philippinica*. (Pl. VI. fig. 3.)

Phyllophora philippinica, Brunner, Abhandl. senckenb. Ges. xxiv. p. 262 (1898).

|| *Phyllophora speciosa*, Walk. Cat. Derm. Salt. iii. p. 430. n. 1 (1870), excl. syn.

Hab. Philippines.

Long. corp. cum tegm. 44 millim. ; lat. tegm. 15 millim.

Male.—Yellow, brown, or of a rich russet colour; front of head waved, always distinctly indented in the middle. Hood with the lateral angles strongly projecting and the lateral spines large; apex of hood pointed. Front lobe with 3 teeth, the first broad, sometimes divided in two, making 4; middle lobe with 2 teeth and sometimes a small one between; hinder lobe with each alternate tooth before the lateral angles, and generally each third tooth behind the angles, larger than the others; hinder lobe with a smooth central carina, obsolete behind; tegmina short, with the apex rounded off; nervures broad, the third cell below the mediastinal nervure from the base with a large black ring surrounding a paler space, and sometimes a few small white dots in black rings beyond. (In the russet-coloured specimen every trace of the spots is obliterated and even the neurulation obscured; but I see no reason to consider it a distinct species.) Cerci long, slender beyond the middle, and curved up at the extremities; subgenital plate nearly as long, broad, cleft at the extremity, and the pointed ends upcurved.

This is the species which Walker considered to represent *P. speciosa*, Thunb., which it resembles in the sharp lateral spines and pointed hood; but it is a much smaller insect and the shape of the tegmina is quite different.

It is a variable species, and in this, as in several others of which we have a series, I notice that the shape of the hood is broader compared to its width in some specimens than in others, showing that this is not a character of real importance.

The Museum possesses four specimens, one immature. Brunner's description is so short that I was at first in doubt as to the identity of the species, and have therefore redescribed it at greater length.

5. *Phyllophora keyica*.

Phyllophora keyica, Brunn. Abhandl. senckenb. Ges. xxiv. p. 263 (1898).

Hab. Ké.

There is an immature female specimen in the Natural History Museum from Ké Dulau which appears to be referable to *A. keyica*.

6. *Phyllophora amplifolia*. (Pl. VI. fig. 1.)

Phyllophora amplifolia, Walk. Cat. Derm. Salt. iii. p. 431. n. 6 (1870).

Hab. Tringany (Malay Peninsula).

Long. corp. cum ovip. 70 millim.; exp. tegm. 170 millim.; lat. tegm. 40 millim.

Female.—Green; front of head slightly indented in the middle; hood pointed at the extremity; the teeth rather large, pointed, and well separated at the base; front lobe with 4, middle lobe with 2, hinder lobe with the alternate spines distinctly larger than the others, or, behind the lateral spines, frequently 2 short spines, instead of 1 between the longer ones; central carina only indicated before the middle; tegmina quite half as broad as long; costa oblique towards the apex, which is completely rounded off; a number of small scattered white dots, generally surrounded with darker; nervures greener than the rest of the tegmina, principal nervure with the first of the three terminal branches nearly straight, the two lower ones separating distinctly beyond; none of the three forked except slightly at their tips, and even the branches of the lowest running to the margin distinctly above the apex.

Front femora with 4 spines on each carina; middle with 5 (not symmetrical); hind femora with about 10.

A very broad-winged species resembling *P. spinosa*, Brunn., but with very numerous short teeth behind the middle spines, one or two shorter spines being placed between each pair of rather longer ones.

7. *Phyllophora speciosa*.

Phyllophora speciosa, Thunb. Mém. Acad. Imp. Sci. St. Pétersb. v. p. 286, pl. iii. (1815).

Hab. —?

Thunberg has not mentioned the locality of his type, and therefore the name of *speciosa* has been applied to several different species of *Phyllophora*. His figures, however,

represent a *Phyllophora* very similar to *P. media*, Walk., but with the sides of the pronotum rather more strongly toothed, and the apex more pointed.

8. *Phyllophora virescens*.

Hyperhomala virescens, Serv. Ann. Sci. Nat. xxii. p. 103 (1831).

Hyperomala virescens, Boisd. Voy. Astrolabe, Ent. ii. p. 649, pl. x. fig. 1 (1835); Serv. Ins. Orth. p. 545 (1839).

Hab. New Ireland.

This species is founded on immature specimens, and cannot be identified till fully developed ones are received from the same locality. An immature *Phyllophora* from Ceram, which Walker regarded as *H. virescens*, is likewise indeterminable at present, the head resembling *P. philippinica* and the hood *P. brunnea*. It is not unlike the figure of *P. speciosa*, Thunb., with which some authors have considered *P. virescens* to be identical.

9. *Phyllophora media*.

Phyllophora media, Walk. Cat. Derm. Salt. iii. p. 431. n. 5 (1870).

Hab. Ceylon.

Long. corp. cum tegm. 72 millim.; lat. tegm. 24 millim.

Male.—Uniform green; hind femora inclining to reddish; front of head entire; hood closely and uniformly punctured, the crenulated borders whitish, and a long spine at the lateral angles; front with two shallow transverse carinæ dividing the hood into three lobes; front lobe with 5 teeth, second with 3, the hindmost in each case rather larger than the others; a longitudinal carina very slightly marked on the front half of the hind lobe; apex of hood rounded off, not dentated; cerci long, slender, upcurved, subgenital plate nearly as long, bifid, the extremities narrow and pointed; tegmina rather broad, the costa and inner margin curving together in a point; mediastinal nervure throwing off a short oblique branch to the costa at about two thirds of its length, and immediately afterwards dividing into two longer branches, the uppermost running obliquely towards the costa, and the principal branch of the lower one reaching the extreme apex of the wing; all these three branches subdivide towards their extremity. Inner margin of tegmina narrowly bordered at two thirds of its length with a ferruginous line, which, after continuing for a short distance, is replaced by small ferruginous spots at the end of the nervures. (The first two lobes of the hood are

testaceous above and on the sides in the specimen before me, but this may be simply due to discoloration.)

Front femora with 3 to 5 spines on each carina; middle femora with at most 5, some of which are extremely small; hind femora with 11 on the outer and 6 on the inner carina.

10. *Phyllophora brunnea*, sp. n.

Phyllophora media ♀ (♀), Walker, Cat. Derm. Salt. iii. p. 431. n. 5 (1870).

Hab. Ceram.

Long. corp. cum tegm. 73 millim.; lat. tegm. 28 millim.

Shape and size of *P. media*, but of a uniform brown (dead-leaf-colour) and with broader tegmina. Hood with rather larger teeth, the front lobe with 4, the middle with 2; the spines at the lateral angles larger and stouter. Hinder lobe with a smooth longitudinal carina throughout its whole length, and with smaller undulating carinae on other portions of its surface; extremity of the hood somewhat more obtuse than in *P. media*. Tegmina with the upper branch of the mediastinal nervure nearly straight, instead of being angulated upwards as in *P. media*, and the two lower branches separate at some distance beyond the origin of the upper one; these are all branched towards the edges. Ovipositor very long, but not extending as far as the tips of the closed tegmina.

Front femora with 3 spines on the outer and 5 on the inner carina; middle femora with 6-8; hind femora with 12-14 on the outer and 7 on the inner side.

11. *Phyllophora eburneiguttata*, sp. n.
(Pl. VI. fig. 5.)

Hab. Fly River, New Guinea.

Long. corp. 40 millim., cum ovip. 51 millim.; exp. tegm. 123 millim., lat. tegm. 23 millim.

Female.—Front of head entire; head, hood, legs, and ovipositor brown (dead-leaf-colour), pleura and sides of abdomen inclining to greenish; hood rather long, the apex rounded off, 4 or 5 teeth on the front lobe, 3 on the middle; lateral angles prominent, with strong spines, the intermediate teeth more distinctly larger than the others before than behind the angle; hinder lobe with the central smooth carina well-marked in front, obsolete behind; tegmina yellow, shaped nearly as in *P. media*; radial nervure running straight to the point where

its upper branch (which is very short) ends in a fork just below the point where the costa begins to curve downwards; the lower branch forks soon afterwards and the upper fork curves outwards and upwards, forking again to the costa just above the apex; the lower fork curves downwards and outwards, ending in three forks, the uppermost extending to the apex; on the basal half of the costal area is a row of 5 round ivory-white spots; below the radial nervure, in the fourth cell from the base, is a large square white blotch, followed by two smaller spots, and there are some smaller white dots near the outer half of the inner margin. Wings subhyaline.

Front femora with 3-4 small spines on each carina; middle femora with 6-7 spines on the front and 5 on the hind carina; hind femora with 10-12 on the outer and 6-7 on the inner carina.

12. *Phyllophora ovalifolia*. (Pl. VI. fig. 4.)

Phyllophora ovalifolia, Sausa., MS. (P).

Hab. Torres Straits.

Long. corp. cum tegm. 55 millim.; lat. tegm. 20 millim.

Female.—Yellowish brown; tegmina varied with yellowish, especially along the course of the nervures; front of head entire; hood with the front lobe with 4 and the middle with 3 teeth, the hindmost in each case much the larger; lateral spines long, slender, and pointed; central carina only slightly marked on the front of the hinder lobe; tegmina rather short and broad, the costa and inner margin curving regularly to the apex, which is not very acute; the three principal branches of the radial nervure branching close together, the upper and lower only forking at their extremities, but the middle one forked again about halfway between its base and the apex, the upper one throwing up several branches above the apex, and the lower one ending in several short branches at the apex.

Front femora with 3 spines on each carina; middle femora with 7 on the hinder carina and only 2 or 3 on the front carina; hind femora with 12 on the outer and 4 on the inner carina.

Resembles *P. philippinica*, but the front is entire and the tegmina are very different in shape and neurulation.

SECTION III.

Lateral angles of the pronotum more or less obsolete, but frequently indicated by the presence of a tubercle larger than the others.

13. *Phyllophora lanceolata*.

Phyllophora lanceolata, Brunn. Abhandl. senckenb. Ges. xxiv. p. 263, pl. xix. fig. 49 (1898).

Hab. Halmahera (Gilolo), Amboina, New Guinea (Stephan-sort), New Britain, Duke of York Island.

Specimens in the Museum from New Guinea, Murray Island, Torres Straits, and New Ireland appear to belong to *P. lanceolata*. In these the tubercle on each side of the pronotum at the broadest point is distinctly larger than the others; but there are several other specimens from New Ireland, New Georgia, Sydney, and the Solomon Islands in which the sides of the pronotum are regularly tuberculated (more coarsely than in *P. inermis*), with no tubercle distinctly larger than the rest.

I regard these specimens as probably varieties of *P. lanceolata*.

14. *Phyllophora Woodfordi*, sp. n. (Pl. VI. fig. 6.)

Hab. Solomon Islands.

Long. corp. cum tegm. 60–74 millim.; lat. tegm. 21–26 millim.

Green, or brownish testaceous; head slightly waved in front, hood long, narrow, slightly rounded off at the extremity, the surface with a more or less reticulated appearance; central carina very slightly marked, the borders whitish, with well-marked tubercles, front lobe with 4 (first and fourth largest), second with 3 (third largest), lateral angles slightly marked, and furnished with a larger tubercle than the others; tegmina moderately broad, tapering at the extremity, apex rounded off, inner margin edged and slightly spotted with blackish. Neuration nearly as in *P. inermis*.

Front femora with 4–7 spines on each carina; middle with 5–8; hind femora with 9–14.

Allied to the last species.

*15. *Phyllophora variegata*.

Phyllophora variegata, Brunn. Abhandl. senckenb. Ges. xxiv. p. 264 (1898).

Hab. New Guinea.

A species probably allied to the last.

16. *Phyllophora inermis*. (Pl. VI. fig. 2.)

Phyllophora inermis, Walk. Cat. Derm. Salt. iii. p. 431. n. 4 (1870).

Hab. — ?

Long. corp. cum tegm. 60 millim.; lat. tegm. 20 millim.

Male.—Green; head slightly waved in front; hood long, narrow, moderately pointed, minutely tuberculated or crenulated; 5 teeth on the front lobe, 4 on the middle; surface with a reticulated appearance; central carina very slightly marked; tegmina moderately broad, tapering at both ends, apex rather long and moderately pointed; a round blackish spot below the radial nervure in the sixth cell from the base, and the inner margin edged and slightly spotted with blackish nearly to the apex; principal nervure with the upper of the three terminal branches nearly straight, the other two separating a little beyond its origin and curving downwards; they are only forked at their extremities, and the lowest runs into the apex.

Front femora with only 2 or 3 very small spines on each carina towards the extremity; middle legs with 5–7, also very small; hind femora with 14 larger ones on the outer and 7 on the inner carina.

*17. *Phyllophora angustata*.

Phyllophora angustata, Brunn. Abhandl. senckenb. Ges. xxiv. p. 264 (1898).

Hab. New Guinea (Kaiser Wilhelm's Land).

Appears to be allied to the last species.

SECTION IV.

Size very large. Pronotum regularly dentated, almost spinose in front, but the tubercles regularly diminishing in size to the extremity.

18. *Phyllophora grandis*.

? *Phyllophora habasqui*, Le Guillon, Rev. Zool. 1841, p. 294.

Phyllophora grandis, Blanch. Voy. Pôle Sud, Zool. iv. p. 364, pl. iii. fig. 3 (1853).

|| *Megalodon ensifer*, Wallace, Malay Arch. ii. p. 434, fig. (1869).

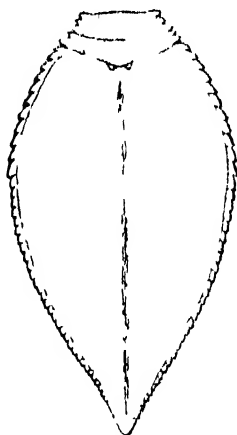
♂ || *Hyperomala virescens*, Brunn. Abhandl. senckenb. Ges. xxiv. p. 265, pl. xx. fig. 50 (1898).

Hab. Triton Bay, New Guinea.

Exp. tegm. 7–9 unc.; lat. tegm. 1

Brown or green; front of head indented in the female; hood

pointed behind, with small teeth gradually diminishing in size, front lobe with 3 or 4, middle lobe with 2; central carina of hinder lobe slightly marked; tegmina of nearly equal breadth throughout, the hind margin gradually rounded



Hood of *Phyllophora grandis*, ♀.

off and exhibiting no projecting apex, principal nervure nearly straight and forming only two short terminal forks about the point where the costa begins to curve.

This is one of the largest grasshoppers of the Old World, and is easily known by its great size (the female expands about 9 inches) and the rounded tegmina. The hood is also of enormous size, measuring 2 inches in length; Wallace says $2\frac{1}{2}$ inches.

I am not sure whether this species is *P. habasqui*, Le Guill., in which case it should take that name, or whether *P. habasqui* is a species allied to *P. lanceolata*.

EXPLANATION OF PLATE VI.

- Fig. 1. *Phyllophora amplifolia*, p. 305.
- Fig. 2. — *inermis*, p. 310.
- Fig. 3. — *philippinica*, p. 304.
- Fig. 4. — *ovatifolia*, p. 308.
- Fig. 5. — *eburneiguttata*, p. 307.
- Fig. 6. — *Woodfordi* (hood), p. 309.
- Fig. 7. — *aruana*, p. 303.

The hood and fore wing of each species is represented, except in the case of *P. Woodfordi*.

BIBLIOGRAPHICAL NOTICE.

Life and Letters of Sir Joseph Prestwich, M.A., D.C.L., F.R.S., &c.
Written and Edited by his Wife. With 12 Portraits and 16 other
Illustrations. 8vo, 444 pages. Blackwood and Sons, Edinburgh
and London. 1899.

JOSEPH PRESTWICH, born at Clapham, 12th March, 1812 (died at Shoreham, Kent, 23rd June, 1896), was of good descent and parentage, had good natural abilities, and was brought up in an affectionate family circle, with the discipline of a well-directed home and early schooling. Hence he was fairly well trained to appreciate all opportunities of observing people and things, and gaining useful experience in whatever line of life he had to follow. Part of his school-time was passed in France, pleasantly and with great advantage to him subsequently, for he was as much at home with French circles as with his English friends when Science had claimed him as a devotee. As a youth in London he diligently followed his college studies; and the leisure hours of his young days were fully occupied with systematic reading and with amateur work in physics and chemistry.

His father's business soon engaged his time and energies, both at the office in Mark Lane and in travelling all over the kingdom among customers in the spirit-and-wine trade. Road-side diggings, gravel-pits, and other excavations, also wells and springs, had always excited his curiosity. By 1830 he had got together some fossils and minerals, and formed a scrap-book of geological pictures, sections, and quotations; and when the family were staying at Boulogne he geologized in the district, and took his young brother to see some quarries there. Whilst at Broseley, in Shropshire, soon afterwards, his attention was attracted to the coal-works of Coalbrookdale; and at once he applied himself to understand and make plain to others the facts and conditions of the existence and origin of this peculiar and valuable district. His bright intelligence and wide grasp of mind enabled him not only to observe, but to generalize on the subjects that occupied his thoughts. Hence the broad fields of his research and the highly useful results that came of his labours.

The Geological Society of London published his memoir in full, with a good map and several plates of sections and fossils of the Coal-measures of Coalbrookdale, and in 1849 awarded to the author their *Wollaston Medal*, for this and some subsequent memoirs on the Tertiary Districts of London and Hampshire. The above-mentioned early work on the Coal-measures was the basis of his further study of that important group of strata, and ultimately culminated in his nationally important Reports (Royal Coal Commission, 1866-1871) —(1) "On the Somerset and Gloucester Coal-field," and (2) "On the probability of finding Coal under the newer Formations in the South of England."

His long, we may say lifelong, study of the English and French

Tertiaries resulted in a complete knowledge of their natural history and structure, freely communicated to the world, and useful in both scientific and economic aspects. Among other results he recognized in detail their capability of collecting and storing rain-water and of yielding water-supplies at different localities. Hence his personal value as one of the Royal Commissioners on the supply of water to the Metropolis (1866-1869) and the importance of his remarks on springs and wells in his Presidential Address to the Geological Society in 1872, and his papers on the Oxford Water-supply in 1876. He had long been F.R.S., F.G.S., and F.C.S.

The Quaternary deposits necessarily had his attention at the same time with the Tertiary and other strata on which they lie, and enabled him to describe with precision the successive stages of denudation that gave origin to the valleys in North-western France and in the South and East of England. Many of his memoirs elucidate different aspects of this subject. Some gravel beds yielding stone implements of Early Man, and various cave-deposits containing remains of prehistoric people, and relics of animals now extinct or limited to other climes, were carefully studied by him. In these researches he was specially associated with the late Dr. Hugh Falconer, one of whose nieces Prestwich married in 1870. This talented and amiable lady, after twenty-six years of devoted companionship in happy domestic life and useful scientific labours, survived him until August 31st, 1899. The widow's pen, indeed, has given us the Biography under notice: and her well-sustained energy collected the numerous letters to or from eminent men, often dealing clearly with controverted subjects, and illustrating his wonderful scientific activity, his charming sociability, and the lifelong friendships in a very wide circle, at home and abroad, around the now lamented friend and husband.

His happy marriage in 1870 made an opportunity for an excursion on the continent, longer than usual and brightened with the companionship of his sympathetic bride, whose account of this visit to Paris and Naples is given in Chapter viii. in her usual lively and charming style. After forty years of City-life he retired from business in 1872. In eighty books, memoirs, and lesser papers he had published the results of observations made, mostly alone, but sometimes in company with geological friends, in his short business visits and occasional holiday (Easter) excursions. This useful application of scattered leisure hours was as fertile in geology as the whole lifetime of some others. His intention to utilize a more continuous leisure time was only partially realized at Aix, the Boulonnais, and elsewhere abroad; at Weymouth, Dorchester, Lulworth, and Portland; and at Settle, Ingleborough, &c. in Yorkshire. After the Report on Brixham Cave he finished his great paper on Deep-sea Temperature and a memoir "On the Geological Conditions affecting the Construction of a Tunnel between England and France." In respect of this the Telford Gold Medal and Premium were awarded to the author.

To the building of his new house (Darent-Hulme) on a lovely hill in Kent, and the planning and planting its grounds, he had devoted much of his scanty leisure time in 1868; its well-remembered hospitable rooms bore inside and out typical characteristics of French and English materials in the building-stones and marbles, and the decorations were sculptured fossils and artistic paintings of palæontology.

In 1874 Prestwich was invited to take the Professorship of Geology at Oxford—an appointment honourable both to him and the University. Everything combined to render Oxford, its society and its surroundings, pleasant to the new-comers; and the College work was a pleasure to the geologist. The holidays led the Professor and his wife to South Wales, Scotland, North and South England, the Channel Islands, and elsewhere—to scenes both old and new.

All subserved, however, to the continuance of his geological studies, and particularly to the writing of his grand text-book of 'Geology, Chemical, Physical, and Stratigraphical,' vol. i. 1886, and vol. ii. 1888. This consists for the most part of complete philosophical essays on its several component parts or subjects, with clear scientific explanation of the details required by teacher and amateur. The University had made him M.A., and now conferred the degree of D.C.L. He was Honorary Member and Correspondent of at least nineteen scientific societies, British and foreign.

As before mentioned, Professor Prestwich (knighted in 1895) had warmly taken up the subject of early man and his implements of stone. Some of the latest and most interesting of these he collected, with the help of Mr. Benjamin Harrison, of Ightham, on the Chalk plateau overlooking that village in Kent. Sir Joseph Prestwich has left to the British Museum his collection of these old, brown, and, at first sight, anomalous flint tools, dressed by chipping on the edges into some seven or eight definite patterns—different from the leaf-shaped and spear-head so-called palæolithic kinds, produced by general chipping on surface and edge.

Another subject, his notes on which he had lately brought to more mature consideration, was the submergence in Quaternary times of South-western Europe and the Northern coasts of the Mediterranean, succeeded by an emergence and producing diluvial results, which may have originated the tradition of a great deluge.

Lady Prestwich's complete and elegant biography is supplemented by Sir A. Geikie's admirable summary of Sir Joseph's geological work and opinions, and, indeed, comprises a lucid account of much of the progress of Geology during the lifetime of our lamented friend. We borrow Sir Archibald's well-considered words:—"While his writings will perpetuate his scientific achievements, it should be placed on record that it was not these achievements alone which gave Joseph Prestwich his pre-eminence among his contemporaries, but that he owed this position in a large measure to the integrity and charm of his character."

MISCELLANEOUS.

Researches upon the Defensive Glands of Bombardier Beetles.

By FR. DIERCKX.

IN a note published in the 'Comptes Rendus' of January 23, 1899, Mons. L. Bordas describes the anal gland of *Carabus nemoralis*, Illig. For a long time past we have studied the same organ in a considerable number of species, and we have arrived at results that do not always agree with those of M. Bordas. We have therefore thought it useful to introduce a few critical observations into the description of an allied type, which in many respects is more interesting.

Since the species of *Brachynus* present a strong contrast to the rest of the Carabidae, owing to the faculty which the various species possess of projecting, with crepitation and the formation of a conspicuous puff of vapour, the secretory product of their *anal glands*, let us seek to determine the conditions of this phenomenon.

I. ANATOMY.—In *Brachynus crepitans*, L., the glandular apparatus is double and situated, as in the other Carabidae, on both sides of the rectum. Each element is composed of a secreting portion, a collecting-duct, and a reservoir.

A. *Secretory lobes*.—Each cylindrical lobe of the aciniform gland is traversed by a duct with a cuticular wall strewn with little nuclei. Between this axial duct and the enveloping *propria* lie the active cells, each enclosing, besides the nucleus, a *radiated pyriform vesicle*, drained by a canaliculate filament. M. Bordas does not mention this intracellular vesicle in the case of *Carabus nemoralis*; we have observed it in all the species examined, with modifications interesting from the point of view of taxonomy.

B. *Collecting-duct*.—This is from 25 to 30 millim. in length in the case of *Brachynus*, and is constituted by two tubes which fit one into the other, the innermost of which is kept wide open by means of a series of hyaline cuticular disks, which are set more or less close together from one end of the duct to the other. Excluding the *propria*, there is only a *single layer of cells*; the axial tube which is enclosed therefore results cytologically from the cells of the outer wall, where the nuclei are always ensconced. The species of *Carabus* have the disks merely outlined, and the tube does not possess a double wall. In *Panagæus* the outline of the disks has entirely disappeared. From this simpler condition to the more complex forms the differentiation of the cells varies greatly; but, in no species have we met with a wall consisting of several layers of cells. We do not know how M. Bordas was able to detect in this structure, in the case of *Carabus nemoralis*, two muscular coats and an internal epithelium with flattened cells.

C. *Reservoir*.—This is in the shape of a wallet with the convex side towards the axis of the body. The collecting-duct opens in the

concave depression. The anterior sac corresponds to the ovoid reservoir in the other genera; the posterior sac is the homologue of their cylindrical ejaculatory duct. It opens by two pores at the tip of the pygidium, a little in front of the anus. In *Carabus* the discharging-pores are about 2 millim. from the median line and about 1 millim. behind the posterior stigmata. According to M. Bordas the gland would open into the cloaca, and its action would imply a mechanism of an extremely complex character.

II. *Physiology*.—*The fluid secreted*.—This is colourless, limpid, with a slight but characteristic odour, and much less acid than the product of *Carabus*. Its most remarkable property is its very great volatility. *It boils*, according to our observations, *at a temperature of about +9° C.*, under a pressure of 760 millim.

Anatomical proofs.—(1) The feebleness of the muscular wall of the reservoir in comparison with the mechanical effects produced; (2) the existence in the reservoir of transverse stays, destined without doubt to counterbalance the internal pressures; (3) the enlargement of the ejaculatory duct near the external aperture of the gland, in view of the abrupt expulsion of the glandular fluid; (4) the presence in the discharging-pores of chitinous pieces bristling with hairs, and capable of performing the function of a pulverizer.

Physiological proofs.—(1) *The explosive nature of the crepitation*; (2) *the effervescence*, which results at the expense of the glandular fluid on dissection under water or on slides as soon as the organ is injured, but *only at a temperature higher than +8° C.*; (3) the crepitation that takes place *upon the dead insect* when one opens the discharging-pores.

III. *MODE OF ACTION*.—The insect, on being alarmed, protrudes its hind quarters (*dégaine l'arrière-train*); if the obturator sphincters then relax, the liquid contents of the reservoir escape *under pressure*, and the jet is divided up by the chitinous combs of the orifice. It is, on a small scale, the action of a bomb charged with liquefied carbonic acid gas.

In spite of the perfect limpidity of the glandular secretion, the discharge leaves a fixed yellowish residue, already observed by Dufour. It is shown by the microscope to be identical with the contents of the rectum. At the moment of danger the insect bends its abdomen downwards; this curvature brings the discharging-pores beneath the anal sphincter. When, in this attitude, the volatile liquid is liberated, while the rectum empties itself, the squib will go off beneath the body, from behind forwards, reducing to powder the ejected excrement—a case-shot of a new kind, well calculated to disconcert the most audacious and best-armed aggressor*.—*fromptes Mendus*, t. cxxviii. no. 10 (March 6, 1899), pp. 622-624.

* Extracted from an "Étude comparée des Glandes pygidiennes chez les Carabides et les Dytiscides," carried out under the direction of Prof. Gilson at the Carnoy Institute at Louvain.

THE ANNALS

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XXXIII.—*Additional Notes on some Type Specimens of Cretaceous Fishes from Mount Lebanon in the Edinburgh Museum of Science and Art.* By A. SMITH WOODWARD, F.L.S.

SINCE the publication of a series of notes on some type specimens of Cretaceous fishes in the Edinburgh Museum last November (Ann. & Mag. Nat. Hist. ser. 7, vol. ii. pp. 405–414) Dr. Traquair has kindly lent me the remaining specimens, which seem to need further examination and description. To these the following notes relate.

1. *Pseudoberyx longispina*, J. W. Davis, Trans. Roy. Dublin Soc. [2] vol. iii. (1887), p. 511, pl. xxv. fig. 2. [= *Nematonotus Bottæ*, Pict. & Humb., sp.]

The so-called “unique specimen” described as the type of *Pseudoberyx longispina* is distorted in the abdominal region, as indicated by the position of the dorsal and pelvic fins with reference to the margin of the squamation. The length of the head with opercular apparatus seems to have been approximately equal to the maximum depth of the trunk and contained twice in the length from the pectoral arch to the base of the caudal fin. The head is remarkably short and deep, and a rod-shaped fragment in the position of the upper jaw might be part of a Scopeloid or Acanthopterygian premaxilla. Allowing for those hidden by the opercular apparatus, there must have been about thirty vertebrae, and at least sixteen of

these are clearly caudal, with robust, gently arched neural and hæmal spines; as noted by Davis, there is a much-expanded hypural bone. The remains of the paired fins prove them to have been very small, and the pelvic pair must have been opposed to the anterior part of the dorsal fin. The latter is situated completely within the anterior half of the trunk, and seems to be borne by twelve supports. Its two foremost rays are comparatively small and short; the third is excessively elongated, as shown in Davis's figure, articulated in its distal two thirds, but not subdivided; the following rays, which are shorter and both divided and articulated distally, rapidly decrease in length. Behind the fin Davis recognizes "a number of fin-rays extending some distance towards the tail"—a deceptive appearance due to the crushing of the imperfectly preserved scales. The anal fin is very small, probably with not more than seven or eight short rays, and separated from the caudal fin by a space about equal to the length of its own base-line. The inequality in length of the lobes of the caudal fin noted by Davis is evidently due to accidental distortion in the fossil. The scales are rather large and quite smooth, and appear to me to be cycloid, without any trace of serrations.

If this fossil be carefully compared with the specimens from Hakel in the British Museum, rightly labelled "*Clupea Bottæ*, Pictet & Humbert," by the late William Davies, it will be found to agree in every essential particular. Although Pictet and Humbert failed to discover the extreme elongation of the third dorsal fin-ray, this character is distinctly shown in some of the specimens just mentioned. The fish, however, does not belong to the genus *Clupea*, as indicated by the absence of ventral ridge-scales, while it is excluded even from the family Clupeidæ by the structure of the upper jaw. The specimens in the British Museum prove that the rod-like premaxilla forms the complete upper margin of the mouth, excluding the equally slender maxilla. *Clupea Bottæ*, with which *Pseudoberyx longispina* is included, may thus be regarded as the type of a new genus of Scopelidæ, NEMATONOTUS, defined as follows:—Trunk short and robust, and maximum depth at origin of dorsal fin. Mandibular suspensorium nearly vertical; jaws delicate and teeth minute. Vertebrae about 30 in number, half being caudal; ribs moderately robust. Paired fins very small, the pelvic pair opposed to the dorsal, which is situated completely within the anterior half of the back, short-based and much elevated, with at least one ray excessively elongated; anal fin relatively small and remote; caudal fin stout but deeply forked.

Scales large and uniform, moderately thick, smooth and not serrated.

2. *Homonotus pulcher*, J. W. Davis, *loc. cit.* p. 519, pl. xxv. fig. 3. [= *Pycnosterinx Russegeri*, Heck.]

Careful comparison proves that the type specimen of this so-called new species is a small distorted example of *Pycnosterinx dorsalis*, Pictet, which is doubtless to be identified with the original *P. Russegeri* of Heckel.

3. *Exocætoides minor*, J. W. Davis, *loc. cit.* p. 551, pl. xxvi. fig. 5.

The more imperfect of the two type specimens of *Exocætoides minor*, now in the Edinburgh Museum, is evidently that described in the text. The interorbital and rostral portions of the cranium are shown to be narrow and compressed, while the quadrate articulation is distinct on each side, proving the gape of the mouth to be small, not extending backwards beyond the anterior margin of the orbit. The structure of the upper jaw is not clear. The number of vertebrae is not easily ascertained, but seems to be between 30 and 40; and there are traces of the stout transverse processes bearing the slender ribs. Remains of the clavicles prove these bones to be large and robust, but the abnormal arrangement here described by Davis is not traceable. The paired fins are described by Davis, but he has omitted to observe a trace of the dorsal between the pelvic pair. His so-called dorsal near the end of the tail is the comparatively small anal fin.

The second specimen figured by Davis (*loc. cit.* pl. xxvi. fig. 1), and only briefly noticed by him, is in the British Museum (no. P. 4756). This shows the dorsal fin, with about 7 rays, above or immediately in front of the pelvic pair, while the anal is comparatively small and remote, as in the first specimen now described.

4. *Lewisia ovalis*, J. W. Davis, *loc. cit.* p. 593, pl. xxxiii. fig. 6. [= *Spaniodon brevis*, Pict. & Humb.]

In his description of the head of this fish Davis does not make sufficient allowance for imperfections and the result of crushing. It exhibits a very stout apparently toothless premaxilla, and the articulation of the mandible is clearly below the hinder border of the orbit. Remains of the right mandibular ramus bear a very large erect lanceolate tooth near

the symphysial end, and the lower portion of the left mandibular ramus (described as "a narrow bone" by Davis) is shown from within. Except the large laniary just mentioned, the remains comprise no traces of teeth. The head, indeed, has precisely the aspect of that of *Spaniodon*, which is characterized by a single pair of enlarged teeth near the symphysis of the mandible. If the trunk and fins be carefully compared with *Spaniodon*, they also will be found to present no generic differences from the latter. The number of vertebrae is approximately 50, and, as shown by the sigmoidal curvature of the vertebral axis, the abdominal region is shortened by crushing. The fins, as described and figured by Davis, are exactly those of *Spaniodon*. Allowing, indeed, for the distortion already mentioned, there is no reason why the fish should not be referred to *Spaniodon brevis* *. Possibly the resemblance escaped Davis's observation on account of the extreme distortion of the specimen which he selected to represent the latter species †.

5. *Pantopholis dorsalis*, J. W. Davis, *loc. cit.* p. 600, pl. xxxvi. fig. 2.

The specimen on which this genus and species are founded is still unique, and unfortunately too imperfect to display the essential characters of the fish it represents. The head is distorted and exposed chiefly from beneath, but only a few fragments are distinguishable. It is clear that the postero-lateral portion of the cranium was ornamented with fine radiating lines. Remains of the two opercula show that they were similarly ornamented with very prominent fine ridges radiating backwards from the point of suspension. The mandible must have been slender, about as long as the cranium, and probably destitute of external ornament. Near its symphysial end, but not quite at the extremity, is a relatively large lanciform tooth, laterally compressed, the crown marked by very feeble longitudinal striations, the base slightly expanded and fused with the dentary bone. Remains of three similar but smaller teeth are seen well-spaced further back in the same ramus. Another large laterally-compressed tooth, evidently displaced, is also exposed below the anterior end of the ramus, and there are scattered traces of comparatively small pointed teeth. Beneath the mandible there are indications of about 12 pairs of slender, well-spaced, branchiostegal rays, as already noted by Davis. The vertebral centra

* Pietet & Humbert, *op. cit.* p. 86, pl. xii. figs. 3, 4.

† J. W. Davis, *loc. cit.* p. 592, pl. xxxiv. fig. 1.

seem to have been well ossified, but much constricted, and all those preserved belong to the abdominal region. Nothing can be added to the description of the dorsal scutes given by Davis; but appearances suggest that at the broken hinder end of the fossil the row of scutes terminates, while the dorsal fin begins. The only scales shown are those of the two swallowed fishes in the abdomen.

On the whole, it seems probable that *Pantopholis* will prove to be a member of the same extinct family of Scopeloids as *Enchodus*. It is remarkable for the length and slenderness of the abdominal region, the large size of the pectoral fins, and the unusually numerous median dorsal scutes.

XXXIV.—*Key to the Isopods of the Pacific Coast of North America, with Descriptions of Twenty-two new Species.* By HARRIET RICHARDSON.

[Concluded from p. 277]

IV. ASELLOTA.

Analytical Key to the Families of Asellota.*

- a. Lateral parts of cephalon scarcely expanded. Eyes, when present, small, lateral. Peduncle of inferior antennæ without small accessory appendage outside of third joint. Legs ambulatory, except first pair, which are distinctly subcheliform; legs with dactylus generally uniuugiculate. First pair of pleopoda in female very small, not operculiform. Outer lamella of second pair very large and incrusting, so as to form, together with corresponding lamellæ of other side, a sort of operculum, covering the two succeeding pairs XI. ASELLIDÆ.
- a'. Lateral parts of cephalon usually lamellarly expanded. Eyes, when present, usually subdorsal. Peduncle of inferior antennæ generally with small accessory appendage outside of third joint. Legs subequal in length with dactylus, generally bi- or triunguiculate; first pair sometimes prehensile. First pair of pleopoda in female transformed into a single large opercular plate. Outer lamellæ of two succeeding pairs narrow and confluent with basal part XII. JANIRIDÆ.

* Sars, Crust. of Norway, ii. 1897, pts. 5, 6, pp. 95, 98.

Family XI. *Asellidæ*.24. *ASELLUS*, Geoffroy.

Dactyli of last six pairs of pereopoda uniungiculate. Lateral margins of segments produced. Eyes distinct, lateral. Mandibles strong, with a three-jointed palp. Head without rostrum.

66. *Asellus tomalensis*, Harford.

Asellus tomalensis, Harford, Proc. Cal. Acad. Sci. vii. 1877, pt. i. pp. 54, 55.

Hab. Tomales Bay, California.

Family XII. *Janiridæ*.*Analytical Key to the Genera of Janiridæ.*

- a.* Eyes dorsal. Antennæ of first pair well developed, with multiarticulate flagellum. Antennæ of second pair long, with multiarticulate flagellum, peduncular joints not dilated. Mandibles with a three-jointed palp and with cutting-part separated from molar part by a deep incision.
- b Head without any true rostrum. First pair of antennæ extremely small, with flagellum rudimentary. Second pair of antennæ of moderate length, without any distinctly squamiform appendage. First pair of legs not prehensile. Uropoda extremely small, branches very short, nodiform. 25. *Jara*.
- b'. Head with prominent rostral projection, or with a comparatively small rostrum, or without rostrum. First pair of antennæ well developed; flagellum multiarticulate. Second pair of antennæ very much elongated, with a well-marked scale-like appendage outside of third joint. First pair of legs prehensile, carpus large, subfusiform, and edged inside with spines; propodus narrow, linear, and very movably articulated to carpus, so as to admit of being bent in against it. Uropoda largely developed, with branches slightly unequal.
- c. Head with lateral parts produced to very prominent acute lappets. Segments of thorax with lateral parts lacinate and produced. Caudal segment forming on each side, at the end, a triangular expansion 26. *Ianthe*.
- c'. Head with lateral parts not produced into lappets. Segments of thorax with lateral parts not produced, not lacinate. Caudal segment rounded, not expanded laterally 27. *Janira*.

* *Id.* pts. 5, 6, pp. 98-100, 103, 104.

- a'. Eyes lateral. Antennæ of the first pair small, with flagellum obsolete. Antennæ of the second pair short, with peduncular joints dilated; rudimentary flagellum containing five articles and equal in length to the width of the head. Mandibles with a three-jointed palp and with cutting-part composed of five teeth 28. *Jacropsis*.

25. *JÆRA*, Leach.67. *Jarra wakishiana*, Spence Bate.

Jarra wakishiana, Spence Bate, Lord's Naturalist in British Columbia, ii. 1866, p. 282; C. Bovallius, Bihang till K. Sv. Vet.-Akad. Handl. ii. 1886, no. 15, p. 49.

Hab. Esquimault Harbour, British Columbia.

26. *IANTHE*, Bovallius.*Analytical Key to the Species of Ianthe.*

- a. Head with prominent rostrum; lateral margins incised and produced into two angulations. Second and third thoracic segments with epimeral lobes double. Terminal segment of body with lateral angulations and central portion acute 68. *I. triangulata*, sp. n.
- a'. Head without rostrum; lateral margins entire and produced into one anterior angulation. Second and third thoracic segments with epimeral lobes single. Terminal segment of body with lateral angulations and central portion blunt and rounded 69. *I. erostrata*, sp. n.

68. *Ianthe triangulata*, sp. n.

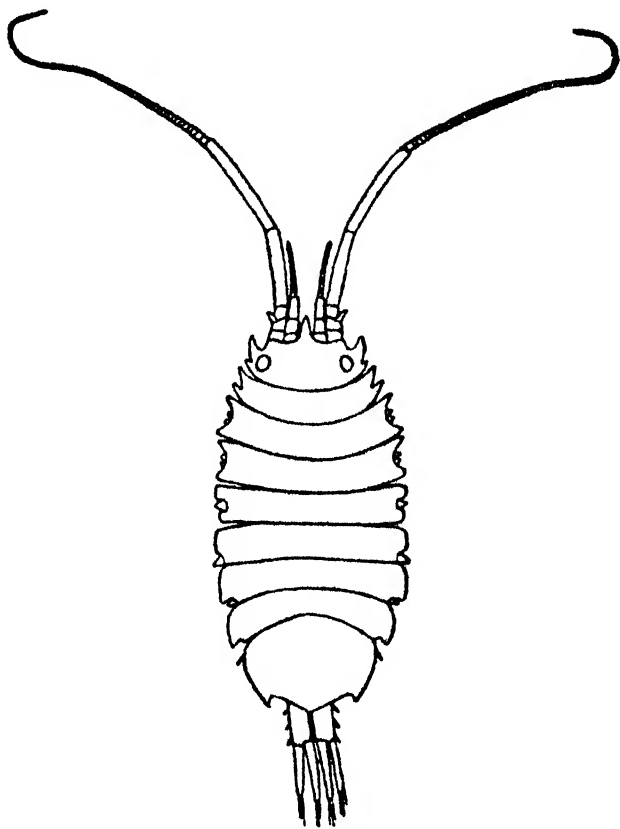
Surface of body smooth; colour yellow, marked with black dots.

Head with rostrum in front equal to one half the length of head. Anterior margin lobate, between the rostrum and the lateral angulations. The side of the head is produced in two angulations, the upper one extending in an oblique direction and not reaching beyond the anterior margin of the head. The first pair of antennæ are not as long as the width of the head. The second pair of antennæ are longer than the body.

The lateral margins of the first segment are produced into two angulations; those of the second and third into two, with the epimera produced into two-lobed angulations; those of the fourth into two lobes, the small epimeral lobe or angulation between; and those of the fifth, sixth, and seventh into one large upper lobe and one small lower lobe.

The terminal segment is produced backward at the sides into two sharply pointed angulations, with a broad triangulate central lobe between, to which the uropoda are attached.

Fig 29.

*Ianthe triangulata.* $\times 13\frac{1}{2}$.

The uropoda are longer than the terminal segment, the outer branch somewhat shorter than the inner one, and both fringed with hairs.

First pair of legs prehensile, remaining pairs simple.

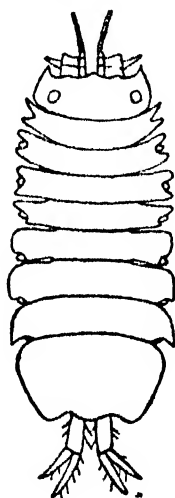
Two specimens were collected by Mr. Heath at Monterey Bay, California.

Type. No. 22582, U.S. N. M.

69. *Ianthe erostrata*, sp. n.

Head two and a half times broader than long, with prominent antero-lateral angulations. Lateral margins produced, entire. In place of the rostrum, which marks all the other known species of this genus, there is a small median point. The eyes are dorsally situated a short distance from the lateral edges. The first pair of antennæ are short, not equal to the width of the head. The second pair are broken in the specimen examined.

Fig 30

*Ianthe erostrata*. $\times 13\frac{1}{2}$.

The first thoracic segment is produced laterally in two angulations. The second, third, and fourth segments are each produced in two angulations, with a small epimeral lobe in between. The fifth, sixth, and seventh segments have each a large anterior lobe and a small posterior epimeral lobe.

The terminal segment has two bluntly triangular angulations, one on either side of a bluntly triangular central portion. The uropoda are about as long as the caudal segment, are styliform, with branches nearly equal. The first pair of legs are prehensile. The others are simple, biunguiculate. One specimen was collected at Chichagof Harbour, Attu (Aleutian Islands), by Mr. W. H. Dall.

Type. No. 22610, U.S. N. M.

27. JANIRA, Leach.

70. *Janira occidentalis*, Walker.

Janira occidentalis, Walker, Trans. Liverpool Biol. Soc. xii. 1898, pp. 280, 281, pl. xv. figs. 7-10.

Hab. Puget Sound, Washington.

28. JÆROPSIS, Kœhler.

71. *Jæropsis lobata*, sp. n.

Surface of body smooth.

Colour very peculiar and striking. The head is brown. The first thoracic segment is perfectly white, without any

Fig. 31.



Fig. 32.

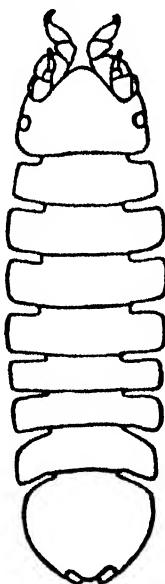


Fig. 33.



Fig. 31.—Maxilliped and mandible of *Jæropsis lobata*.

Fig. 32.—*Jæropsis lobata*. × 20.

Fig. 33.—Antennæ of *Jæropsis lobata*.

markings; the second, third, and fourth segments are brown; the fifth and sixth are white; the seventh thoracic segment and the caudal segment are brown. This peculiar marking gives the body a striped appearance.

Head large; front produced into a prominent triangular process, with rounded apex, very broad at the base, occupying half the anterior margin of the head. The antero-lateral angles of the head are produced in acute angles on either side to a distance equal to half the length of the frontal process. The eyes, which are small, are situated on the extreme lateral margins of the head. The first pair of antennæ are extremely small, equal in length to less than half the width of the head; flagellum obsolete. The second pair of antennæ are also extremely short, equal in length to the width of the head, with rudimentary flagellum, composed of about five joints, and with peduncular joints dilated. Mandibles have the cutting-part composed of five teeth; palp three-jointed.

The thoracic segments are subequal in length, with lateral edges produced, but not lacinate, and separated from each other by lateral incisions.

Caudal segment regularly rounded, with two small incisions at the place where the uropoda are attached, between which is a rounded lobe. Uropoda are extremely small, short, nodiform.

Legs simple, similar in structure, with biunguiculate dactyli.

Two specimens from Monterey Bay, California, were sent by Mr. Heath.

Type. No. 22583, U.S. N. M.

This species is very close to *Jæropsis brevicornis*, but differs in the following points:—the colouring of the body, which in *J. brevicornis* is perfectly transparent and colourless, with the exception of the head, which is marked with a large brown spot, while in our species the head is dark, as are also the entire second, third, fourth, and seventh thoracic segments and the terminal abdominal segment, the other segments being colourless; in the shape of the terminal segment, which is perfectly rounded in *J. brevicornis* and fringed with hairs, while in our species there are two posterior incisions for the reception of the uropoda, and an absence of hairs; in the larger median lobe on the anterior margin of the head; in the acuteness of the antero-lateral angles of the head, which are rounded in *J. brevicornis*; in the more angular post-lateral angles of the head; and in the more angular antero- and post-lateral angles of the thoracic segments. Other differences are noticed from a comparison of both pairs of antennæ.

V. ONISCOIDEA.

Analytical Key to the Families of Oniscoidea.

- a. Flagellum of outer antennæ not multiarticulate. Buccal mass not very prominent below. First maxillæ have two plumose setæ on the inner plate. Mandibles with molar expansion obsolete, without any triturating surface, it being replaced by brush-like recurved setæ. Maxillipeds with terminal part three-articulate; epignath large, flanking the basal part. Sexual appendage of male simple and generally connected with inner rami of first pair of pleopoda. Uropoda with inner branch smaller than outer and attached far in front of it.
 - b. External antennæ generally long, close together, with antennal openings large. Body scarcely able to be contracted into a ball. Head less manifestly immersed in first thoracic segment. Lateral parts of the head separated by a vertical marginal and inframarginal line. Clypeus arched. Legs generally long. Uropoda produced, reaching beyond the terminal segment of the abdomen and the post-terminal segment. Terminal segment narrower than preceding ones and conically produced at end
- XIII. ONISCIDÆ.
- b'. External antennæ generally short, with antennal openings small. Body able to be contracted into a ball. Head immersed in first thoracic segment. Lateral parts of the head undifferentiated. Clypeus perpendicular. Legs generally short. Uropoda short, not reaching beyond the epimera of the terminal segment of the abdomen or the post-terminal segment. Terminal segment short and broad
- XIV. ARMADILLIDIDÆ.
- c. Flagellum of outer antennæ multiarticulate. Buccal mass prominent. First maxillæ have three plumose setæ on the inner plate. Mandibles with molar expansion large and broad, exhibiting a finely fluted triturating surface. Maxillipeds with terminal part distinctly five-articulate; epignath short. External sexual appendages in male double. Inner ramus of first pair of pleopoda of a similar structure in both sexes. Uropoda with both branches styliform
- XV. LIGIDÆ.

Family XIII. Oniscidæ.

Analytical Key to the Genera of Oniscidæ.

- a.* Flagellum of external antennæ biarticulate.
 External opercular ramus of the first, second,
 and rarely of the third or all the pairs of the
 abdominal appendages furnished with trachea.
- b.* Lateral lobes of the head large; frontal lobe
 more or less projecting. Eyes subdorsal.
 First two abdominal segments generally very
 short; three following ones large, with large
 epimera. Terminal segment not reaching
 beyond the epimera of preceding segment.
 Uropoda somewhat even, longer in male than
 in female 29. *Porcellio*.
- b'.* Lateral lobes of head small, hardly projecting;
 frontal lobe obsolete. Eyes lateral. First
 two abdominal segments scarcely shorter
 than those following. Epimera of all the
 segments small. Terminal segment ex-
 tending beyond the epimera of preceding
 segment. Uropoda subequal in both sexes. 30. *Metoponorthus*
- a'.* Flagellum of external antennæ triarticulate.
 External opercular ramus of abdominal append-
 ages containing no special respiratory organ.
- b.* Front of head produced at the middle and at
 the sides in tubercles; lateral tubercles horn-
 like. Epimera of abdominal segments mode-
 rate or small 31. *Alloniscus*.
- b'.* Front of head not produced, with lateral lobes.
 Epimera of abdominal segments large 32. *Lyprobius*.

29. PORCELLIO, Latreille.

Analytical Key to the Species of Porcellio.

- a.* Surface of body smooth.
- b.* Frontal median lobe of head rounded, a
 little produced. Articles of the flagel-
 lum of external antennæ equal in length.
 Last segment of the abdomen with its
 extremity widely rounded 72. *P. formosus*, Stuxberg.
- b'.* Frontal median lobe of head more
 acute, minute. First article of the
 flagellum of external antennæ equal
 in length to the other or a little
 longer. Last segment of the abdomen
 with its extremity acute ... 73. *P. lævis*, Latreille.
- a'.* Surface of body closely and roughly
 granulated 74. *P. scaber*, Latreille.

72. *Porcellio formosus*, Stuxberg.

Porcellio formosus, Stuxberg, Öfversigt af Vetensk.-Akad. Förhandl.
 1875, no. 2, p. 57; Budde-Lund, Crust. Isop. Terrestria, 1883, p. 141.

Hab. San Francisco and San Pedro, California.

73. *Porcellio lœvis*, Latreille.

- Porcellio lœvis*, Latreille, Hist. Crust. Ins. vii. p. 46; Gen. Crust. i. p. 71; Leach, Edinb. Encycl. vii. p. 406; Transact. xi. p. 375.
- Oniscus lœvis*, Lamarck, Hist. Nat. An. s. Vert. v. p. 154; 2nd ed. v. p. 201.
- (?) *Porcellio lœvis*, Risso, Crust. Nice, p. 153; Hist. Nat. pp. 119, 163; Desmarest, Consid. p. 321.
- (?) *Porcellio Degeeri*, Audouin and Savigny, Descript. de l'Égypte, p. 289, pl. xiii. fig. 5.
- Porcellio cucercus*, Brandt, Bull. Soc. Imp. d. Moscou, vi. 1833, p. 177; Milne-Edwards, Hist. Nat. des Crust. iii. p. 168.
- Porcellio syriacus*, Brandt, Bull. Soc. Imp. d. Moscou, vi. 1833, p. 178; Milne-Edwards, Hist. Nat. des Crust. iii. p. 170.
- Porcellio musculus*, Brandt, Bull. Soc. Imp. d. Moscou, vi. 1833.
- Porcellio cinerascens*, Brandt, Bull. Soc. Imp. d. Moscou, vi. 1833, p. 178.
- Porcellio dubius*, Brandt, Bull. Soc. Imp. d. Moscou, vi. 1833, p. 178; Milne-Edwards, Hist. Nat. des Crust. iii. p. 170.
- Porcellio Poeyi*, Guérin, Comptes Rendus, 1837, p. 132.
- Porcellio lœvis*, Milne-Edwards, Hist. Nat. des Crust. iii. p. 169; Règne An. Planch. p. 71 bis, fig. 2.
- Porcellio urbicus*, Koch, Deutsch. Crust. p. 36.
- Porcellio Degeerii*, Brandt, Wagner, Reise Alg. iii. 1836, p. 278.
- Porcellio oratus*, Zaddach, Synops. p. 13.
- Porcellio flavipes*, Koch, Berichtig. &c. p. 206, pl. viii. fig. 97.
- Porcellio Degeerii*, Lucas, Expl. d'Alg. i. pp. 60, 139.
- Porcellio lœvis*, Lereboullet, Mém. de la Soc. de Strasbourg, iv. p. 45, pl. i. fig. 7, pl. iii. figs. 55-60.
- Porcellio Poeyi*, Guérin, Ramon de la Sagra, Crust. p. 67; Saussure, Mém. p. 61, pl. v. fig. 34.
- Porcellio cubensis*, Saussure, Mém. p. 61, pl. v. fig. 35.
- Porcellio Sunichrasti*, Saussure, Mém. p. 62, pl. v. fig. 36.
- Porcellio cotillæ*, Saussure, Mém. p. 62, pl. v. fig. 37.
- Porcellio mexicanus*, Saussure, Mém. p. 63, pl. v. figs. 39, 40.
- Porcellio aztecus*, Saussure, Mém. p. 63, pl. v. fig. 38.
- Porcellio interruptus*, Heller, Verh. zool.-bot. Ges. Wien, xi. p. 495; 'Novara' Exp. p. 136, pl. xii. fig. 6 (vix adult).
- Porcellio lœvis*, Plateau, Crust. Isop. p. 10; Budde-Lund, Nat. Tidsskrift, 3rd ser. vii. p. 236.
- Porcellio aztecus*, Miers, Proc. Zool. Soc. London, 1877, p. 609.
- Porcellio lœvis*, Uljanin, Crust. Turkest. p. 17, pl. iv. figs. 1-10; Budde-Lund*, Crust. Isop. Terrestria, 1885, pp. 138 141; Hansen, Bull. Mus. Comp. Zool. Harvard College, xxxi. 1897, p. 124.

Hab. Distribution world-wide; Colfax, California (*Cook and Jaquay*); Monterey, California; Unalaska.

74. *Porcellio scaber*, Latreille.

- Oniscus asellus*, Linnaeus, Fn. Su. p. 2058; Syst. Nat. i. p. 1061; in part.
- Porcellio scaber*, Latreille, Hist. Crust. Ins. vii. p. 45; Gen. Crust. i. p. 70; Leach, Edinb. Encycl. vii. p. 406.

* See Budde-Lund for further synonymy.

- Oniscus granulatus*, Lamarck, Hist. Nat. des Animaux sans Vertèbres, v. p. 154; 2nd ed. v. p. 261.
Porcellio scaber, Risso, Crust. de Nice, p. 155; Hist. Crust. p. 119.
Porcellio nigra, Say, Journ. Phil. Acad. i. p. 432.
Porcellio granulatus, Brébisson, Mém. Soc. Calv. 1825, p. 261.
Porcellio scaber, Desmarest, Consid. Crust. p. 321; Brandt and Ratzeburg, Med. Zool. ii. p. 77, pl. xii. figs. 1-4 and A-B; Brandt, Consp. p. 14 (Bull. Soc. Imp. d. Naturalistes de Moscou, vi. 1833).
Porcellio Brandtii, Milne-Edwards, Hist. Nat. des Crust. iii. p. 108.
Porcellio granulatus, Milne-Edwards, Hist. Nat. des Crust. iii. p. 109, pl. xxxii. fig. 21.
Porcellio scaber, Milne-Edwards, Cuvier, Règ. An. 1849, pls. lxxi.-lxxi. bis.
Porcellio nigra, Gould, Rep. Crust. p. 337.
Porcellio scaber, Koch, Deutschlands Crust. p. 34.
Porcellio dubius, Koch, Deutschlands Crust. p. 34.
Porcellio asper, Koch, Berichtig. p. 207, pl. viii. fig. 98.
Porcellio scaber, Lereboullet, Mém. Strasb. iv. p. 34, pl. i. figs. 4, 5, pl. ii. figs. 43-47.
Porcellio gemmulatus, Dana, Crust. U.S. Expl. Exp. 1853, p. 725, pl. xlvii. fig. 7; Stimpson, Journ. Bost. Soc. Nat. Hist. vi. p. 66.
Philoscia tuberculata, Stimpson, Proc. Cal. Acad. Sci. i. p. 89.
Porcellio scaber, Sill, Crust. Sieb. 1861, p. 3; Bate and Westwood, Brit. Crust. ii. p. 475.
Porcellio paulenses, Heller, 'Novara' Exp. p. 136, pl. xii. fig. 5.
Porcellio scaber, Plateau, Bull. Acad. r. Belgique, 2nd ser. xxix. 1870, no. 2, p. 8; E. Brandt, Horæ Soc. Ent. Ross. viii. p. 167; Budde-Lund, Nat. Tidsskrift, 3rd ser. vii. p. 238; Prospectus, p. 3; Bos, Crust. Hedrioph. Nederl. pp. 38, 91; Budde-Lund, Crust. Isop. Terrestria, 1885, pp. 120-131*.

Hab. Distribution world-wide; San Francisco, California; San Pedro, California; Puget Sound.

Budde-Lund suggests that *Porcellio gemmulatus*, Dana, differs in no wise from *Porcellio scaber* †.

30. METOPONORTHUS, Budde-Lund.

75. *Metoponorthus pruinosus*, Budde-Lund ‡.

Metoponorthus pruinosus, Budde-Lund, Crust. Isop. Terrestria, 1885, pp. 169, 170.

Porcellio maculicornis, Koch, Deutschlands Crustaceen, 1840, p. 34; Stuxberg, (Efternigt af Vetensk.-Akad. Förhandl. 1875, no. 2, p. 55.

Hab. California.

31. ALLONISCUS, Dana.

Analytical Key to the Species of Alloniscus.

a. Surface of body very densely granulated.

Margins of epimera serrated..... 76. *A. mirabilis*, Stuxberg.

* See Budde-Lund for further synonymy.

† Crust. Isop. Terrestria, 1885, p. 131.

‡ See Budde-Lund for further synonymy.

a'. Surface of body punctate.

b. Lateral processes of the head large,
prominent 77. *A. cornutus*, [Lund. Budde-

b'. Lateral processes of the head small,
scarcely prominent 78. *A. perconvexus*, Dana.

76. *Alloniscus mirabilis* (Stuxberg).

Rhinoryctes mirabilis, Stuxberg, (Eftversigt af Vetensk.-Akad. Forhandl. 1875, no. 2, p. 51.

Alloniscus mirabilis, Budde-Lund, Crust Isop. Terrestria, 1885, p. 229.

Hab. California.

77. *Alloniscus cornutus*, Budde-Lund.

Alloniscus cornutus, Budde-Lund, Crust Isop. Terrestria, 1885, pp. 228, 229.

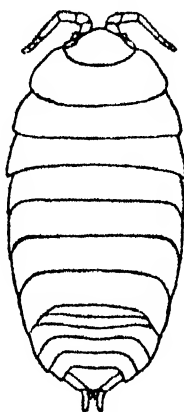
Hab. California.

78. *Alloniscus perconvexus*, Dana.

Alloniscus perconvexus, Dana, Proc. Acad. Nat. Sci. Philad. vii. p. 176; Stimpson, Journ. Bost. Soc. Nat. Hist. vi. p. 60; Budde-Lund, Crust. Isop. Terrestria, 1885, p. 225.

(?) *Alloniscus maculosus*, Harford, Proc. Cal. Acad. Sci. pt. 1, vii. 1877, p. 54.

Fig. 34.



Alloniscus perconvexus, Dana. × 8.

Hab. California; Pacific Grove; Santa Barbara; Monterey Bay, collected by Mr. Heath; Tillamook Head, Oregon.

32. LYPROBIUS, Budde-Lund.

79. *Lyprobius pusillus*, Budde-Lund.

Lyprobius pusillus, Budde-Lund, Crust. Isop. Terrestria, 1885, p. 230.

Hab. California.

Family XIV. Armadillididæ.

33. CUBARIS, Brandt.

Outer branch of the uropoda small or minute, rather smooth. Terminal segment not shorter than uropoda. Terminal segment posteriorly truncate. Clypeus very short, with the superior margin entire, lobated at the sides. Terminal abdominal segment subtetragonal. External branch of the uropoda inserted in the middle of the internal lateral margin of the basal joint.

Analytical Key to the Species of Cubaris *.

- a. Last abdominal segment longer than broad [Lund).
 80. *C. californica* (Budde-
 a'. Last abdominal segment a little trans-
 verse, with median constriction. An-
 tennæ minutely roughened 81. *C. affinis* (Dana).

80. *Cubaris californica* (Budde-Lund).

Armadillo speciosus, Stuxberg, Öfversigt af Vetensk.-Akad. Förhandl. 1875, no. 2, p. 62.

Armadillo californica, Budde-Lund, Crust. Isop. Terrestria, 1885, p. 40.

Hab. California: San Francisco and San Pedro.

Budde-Lund † remarks that perhaps this species does not differ from *Cubaris affinis* (Dana).

81. *Cubaris affinis* (Dana).

Spherillo affinis, Dana, Proc. Acad. Nat. Sci. Philad. vii. 1851, p. 176; Stimpson, Journ. Hist. Soc. Nat. Hist. vi. 1857, p. 65.

Armadillo affinis, Budde-Lund, Crust. Isop. Terrestria, 1885, p. 39.

Hab. California.

Family XV. Ligiidæ.

Analytical Key to the Genera of Ligiidæ.

- a. Uropoda equal in length, styliform, often filiform.
 Interior mala of the mandibles with numerous

* *Cubaris* is oldest synonym of preoccupied *Armadillo* (Stebbing, Hist. of Crust. 1893, p. 433).

† Crust. Isop. Terrestria, 1885, p. 40.

- pencils of hairs. Last segment of body broad, with distinct epimeral plates. Maxillipeds with palp four- to five-jointed; epignath rounded. 34. *Ligia*.
- a'. Uropoda unequal in length.
- b. Extremity of uropods furnished with two long apical bristles. Interior mala of right mandible with three pencils of hairs, of left mandible with five pencils of hairs. Last segment of body small and without any epimeral plates. Maxillipeds with a five-jointed palp; epignath narrow, linguiform. 35. *Ligidium*
- b'. Extremity of uropods not furnished with two long apical bristles. 36. *Stylomiscus*.

34. *LIGIA*, Fabricius.*Analytical Key to the Species of Ligia.*

- a. External antennæ shorter than the body.
- b. Caudal stylets about equal to half the length of body. 82. *L. occidentalis*, Dana.
- b'. Caudal stylets about equal to one fifth the length of body. 83. *L. Pallasii*, Brandt.
- a'. External antennæ longer than body or equal to length of body. Caudal stylets about equal to two thirds length of body. 84. *L. exotica*, Roux.

82. *Ligia occidentalis*, Dana.

Ligia occidentalis, Dana, U.S. Expl. Exp., Crust. ii. p. 742, pl. xlix. fig. 7; Proc. Acad. Nat. Sci. Philad. vii. p. 176; Stimpson, Bost. Journ. Nat. Hist. vi. 1857, p. 60; Harford, Proc. Cal. Acad. Sci. vii. 1877, p. 116; Budde-Lund, Crust. Isop. Terrestria, 1885, p. 264.

Hab. California: San Francisco Bay; San Diego; Sacramento River; Monterey Bay; Lower California.

83. *Ligia Pallasii*, Brandt.

Ligia Pallasii, Brandt, Bull. Soc. Impér. des Natur. de Moscou, vi. 1833, p. 172.

Ligia dilatata, Stimpson, Bost. Journ. Nat. Hist. 1857, p. 67, pl. xxii. fig. 8; S. I. Smith, Report of Progress of Geological Survey of Canada, 1878-79.

Ligia septentrionalis, Lockington, Proc. Cal. Acad. Sci. vii. 1877, pt. 1, p. 46.

Ligia Stimpsoni, Miers, Proc. Zool. Soc. 1877, p. 671 (see footnote).

Ligia Pallasii, Budde-Lund, Crust. Isop. Terrestria, 1885, pp. 261, 262.

Hab. Unalaska; Sitka; Tanager, Aleutian Islands; Victoria, Vancouver Island; Puget Sound; California.

84. *Ligia exotica*, Roux.*Ligia exotica*, Roux, Crust. Médit. p. 3, pl. xiii. fig. 9.*Ligia grandis*, Perty, Spix, H. Martius, p. 212, pl. xl. fig. 13.*Ligia Gaudichaudii*, Milne-Edwards, Hist. Nat. des Crust. iii. p. 157.*Ligia Baudiniana*, Milne-Edwards, Hist. Nat. des Crust. iii. p. 155.*Ligia (Itahca) coriacea*, Koch, Deutschl. Crust. p. 36; Berichtig. p. 211.*Ligia Gaudichaudii*, Dana, Expl. Exp. p. 741, pl. xlix. figs. 6 a-h; Nicolet, Gay, Hist. Chile, iii. p. 265.*Ligia Baudiniana*, Miers, Proc. Zool. Soc. 1877, p. 670.*Ligia exotica*, Budde-Lund, Crust. Isop. Terrestria, 1885, pp. 260-268.*Hab.* Widely distributed; California; Topolobampo, Mexico (Mr. Edward Palmer).35. *LIGIDIUM*, Brandt.*Analytical Key to the Species of Ligidium.*

- a. Inner process of the basal article of the uropoda three times shorter than the terminal external branch; internal terminal branch reaching the apex of the external branch; the two terminal hairs equal in length to the external branch. 85. *L. hypnorum* (Cuvier).
- a'. Inner process of the basal article of the uropoda four times shorter than the terminal external branch; internal terminal branch long, extending much beyond the apex of the external branch, being a sixth part longer; the two terminal hairs short, equal in length to half the external branch 86. *L. tenue*, Budde-Lund.

85. *Ligidium hypnorum* (Cuvier).*Oniscus hypnorum*, Cuvier, Journ. d'Hist. nat. ii. p. 19, pl. xxvi.*Ligidium hypnorum*, Budde-Lund, Naturhistorisk Tidsskrift, 3rd ser. vii. 1870, p. 225; Stuxberg, Öfversigt af Vetensk.-Akad. Forhandl 1875, no. 2, p. 48.*Hab.* California (Stuxberg).86. *Ligidium tenue*, Budde-Lund.*Ligidium tenue*, Budde-Lund, Crust. Isop. Terrestria, 1885, p. 258.*Hab.* Sitka Island.36. *STYLONISCUS*, Dana.87. *Styloniscus gracilis*, Dana.*Styloniscus gracilis*, Dana, Proc. Acad. Nat. Sci. Philad. vii. 1854-55, p. 176; Stimpson, Journ. Bost. Soc. Nat. Hist. vi. 1857, p. 66; Budde-Lund, Crust. Isop. Terrestria, 1885, p. 271.*Hab.* California.

VI. EPICARIDEA.

Family XVI. Bopyridæ*.

Body of female primarily disciform, variously modified subsequently by retrogressive metamorphosis; distinctly segmented; more or less asymmetrical, twisted now to right, now to left; dorsal face flattened; head deeply sunk in thorax and carrying in front two pairs of rudimentary antennæ; eyes, when present, dorsal. Maxillipeds lamellar, biarticulate, obtecting the oral area below, and more frequently exhibiting a small terminal joint, and, at base, two curved lanceolate appendages. Legs seven pairs, sometimes obsolete on one side, and all of same structure, short, prehensile; coxal plates obsolete or distinctly defined. Incubatory plates, five pairs, more or less arching over the ventral face of the thorax; first pair, as a rule, concealed by second and divided by a transversal fold into two segments. Abdomen more or less distinctly segmented; pleopoda forming simple or double lamellæ, all of the same structure, rarely obsolete. Uropoda when present simple lanceolate. Male elongate, very small, symmetrical; segments of thorax distinct, those of abdomen sometimes distinct, sometimes confluent. Mouth-parts simple, conic; posterior antennæ with flagellum four-articulate; legs of uniform structure; uropoda with inner branch shorter than outer. Parasitic on decapodous Crustacea †.

This family has not been sufficiently worked up to offer as yet any systematic arrangement of the genera ‡.

37. ARGEIA, Dana.

Analytical Key to the Species of Argeia.

- a. Head transversæ. All the thoracic branchial appendages present. All the abdominal appendages present. 88. *A. pugettensis*, Dana.
 a'. Head bilobate. Thoracic branchial appendages apparently absent in some of anterior segments. Last three pairs of abdominal appendages wanting. 89. *A. depauperata*, Stimpson.

* Sars, 'Crustacea of Norway,' ii. 1898, pp. 196, 196, pls. xi., xii.

† Bopyridæ parasitic on *Crangon crangon* (Linneus), *Nectocrangon* lar (Owen), *Nectocrangon alaskensis*, Kingsley, and other shrimps, have been reserved for more detailed study.

‡ See Hansen, Bull. Mus. Comp. Zool. Harvard College, xxxi. (1897) p. 112.

88. *Argeia pugettensis*, Dana.

Argeia pugettensis, Dana, U.S. Expl. Exp., Crust. ii. p. 804, pl. liii. fig. 7; Stimpson, Bost. Journ. Nat. Hist. vi. 1857, p. 71.

Hab. Puget Sound, on *Crangon munita*.

89. *Argeia depauperata*, Stimpson.

Argeia depauperata, Stimpson, Bost. Journ. Nat. Hist. vi. 1857, p. 71.

Hab. San Francisco Bay, on *Crangon franciscorum*.

38. PHYLLODURUS, Stimpson.

90. *Phyllodurus abdominalis*, Stimpson.

Phyllodurus abdominalis, Stimpson, Bost. Journ. Nat. Hist. vi. 1857, p. 71; Lockington, Proc. Cal. Acad. Sci. vii. 1876, pt. 1, p. 57.

Hab. Puget Sound; Tomales Bay, California; "on the common *Upogebia*."

39. BOPYROIDES, Stimpson.

91. *Bopyroides acutimarginatus*, Stimpson.

Bopyroides acutimarginatus, Stimpson, Proc. Acad. Nat. Sci. Philad. xvi. 1864, p. 156.

Hab. Puget Sound, on *Spirontocaris brevirostris*.

40. PSEUDIONE, Kossmann.

Analytical Key to the Species of Pseudione.

- | | |
|---|---|
| <p>a. Antennæ five-jointed. First pair of maxillæ absent. In male, eyes present; maxillæ wanting; last segment of abdomen cordate in form, being narrow anteriorly and having its hinder margin notched</p> <p>a'. Antennæ four-jointed. Maxillæ normal, present. In male, eyes wanting; maxillæ normal, present; last segment of abdomen triangular and entire . . .</p> | <p>92. <i>P. Guardi</i>, Calman.</p> <p>93. <i>P. galacanthæ</i>, Hansen.</p> |
|---|---|

92. *Pseudione Guardi*, Calman.

Pseudione Guardi, Calman, Ann. N. Y. Acad. Sci. xi. 1898, no. 13, pp. 274-281, pl. xxxiv. fig. 5.

Hab. Puget Sound, on *Pagurus ochotensiu* (Brandt).

93. *Pseudione galacanthæ*, Hansen.

Pseudione galacanthæ, Hansen, Bull. Mus. Comp. Zool. Harvard College, xxxi. 1897, pp. 118-120, pl. v. fig. 22 f.

Hab. Gulf of California, in branchial cavity of *Galacantha diomedæa*, var. *parvispina*, Faxon.

41. BATHYGYGE, Hansen.

94. *Bathyggyge grandis*, Hansen.

Bathyggyge grandis, Hansen, Bull. Mus. Comp. Zool. Harvard College, xxxi. 1897, pp. 122, 124, pl. vi. figs. 2, 2 e.

Hab. Off Acapulco, in branchial cavity of *Glyphocrangon spinulosa*, Faxon.

42. CRYPTIONE, Hansen.

95. *Cryptione elongata*, Hansen.

Cryptione elongata, Hansen, Bull. Mus. Comp. Zool. Harvard College, xxxi. 1897, pp. 112-115, pl. iii. figs. 5, 5 a, pl. iv. figs. 1, 1 g.

Hab. Near Galapagos Islands, in branchial cavity of *Nematocarcinus Agassizii*, Faxon, which occurs as far north as Acapulco, Mexico.

43. PARARGEIA, Hansen.

96. *Parargeia ornata*, Hansen.

Parargeia ornata, Hansen, Bull. Mus. Comp. Zool. Harvard College, xxxi. 1897, pp. 120-122, pl. vi. figs. 1, 1 f.

Hab. Off Acapulco, Mexico, in branchial cavity of *Sclerocrangon procax*, Faxon.

44. IONE, Latreille.

97. *Ione cornuta*, Spence Bate.

Ione cornuta, Spence Bate, Lord's Naturalist in British Columbia, ii. 1866, p. 282.

Ione thoracica, Heller, Carcinolog. Beitrag z. Fauna der Adriat. Meeres, Verhand. zool.-bot. Gesellsch. Wien, xv. pp. 979-984, pl. xvii.

Ione cornuta, Bate and Westwood, Brit. Sessile-eyed Crust. ii. p. 253; Giard and Bonnier, Contributions à l'étude des Bopyriens, 1887.

Hab. Esquimault Harbour, British Columbia, in branchia of *Callianassa longimana*; Vancouver Island.

XXXV.—*Phoca caspica* and *Phoca grænlantica*.

By Prof. F. A. SMITT.

FOR identification of some subfossil bones of a seal which were found several years ago in the glacial marl in the south of Halland (west coast of Sweden), and sent to the Royal Museum of Stockholm by the late Senator P. von Möller, I had of course to compare them with the living species of Scandinavian and Arctic seals, but was struck by some discrepancies in all of them. The subfossil bones were the following:—the eight posterior dorsal vertebræ, the five lumbar vertebræ, the sacrum, one caudal vertebra, ribs from the right side nos. I.–XIV., from the left side nos. II.–XV., one of the middle segments of the sternum, the pelvis with the loose os penis, both the femora, the left tibia with the fibula; of the left foot there were the following bones—astragalus, calcaneum, scaphoideum, metatarsalia I., II., IV., and V., and the first phalanges of the five toes. This material cannot be called scanty, and in other circumstances would have been sufficient for a trustworthy determination of the species, as at first sight there could not be more than four species of the European fauna to be taken into consideration, viz.:—*Phoca vitulina*, *Ph. fastida*, *Ph. caspica*, and *Ph. grænlantica*, of which the last has already been found once (perhaps twice) in the Swedish glacial marl.

The two first-named species were easily excluded from the comparison, because, so far as I know, they always have the length of their femur, measured from the lower tip of the inner condyle to the upper tip of the trochanter, more than half the length of the tibia, or, if measured from the middle of the lower margin of the articular (intercondyloid) groove to the upper margin of the collum, more than 40 per cent. of the length of the tibia. As to the other two species, which have the greatest likeness to each other, at first it seemed impossible to refer the subfossil bones to the *Phoca grænlantica*, because although of comparatively small size they are very strongly ossified. Thus, for instance, in one of our skeletons of *Phoca grænlantica*, with a tibial length of 224 millim., and with the two above-named femoral measurements of 103 and 84 millim. respectively, the epiphyses have not been ankylosed to the respective diaphyses, while in the subfossil skeleton, with a tibial length of 186 millim. and with the two femoral measurements 91 millim. and 73.5 millim. respectively, the ossification has completely united the epiphyses and diaphyses; and in this respect the subfossil

bones agree with the corresponding bones in a skeleton of *Phoca caspica* of about 12 decim. length (to the tip of the tail), with tibia of 151 millim. and femur of 82 millim. and 67 millim. (as above). Although this difference of ossification may depend on several other differences, the question thus arose whether the subfossil bones did not belong to *Phoca caspica* or perhaps to an extinct and hitherto unknown variety of *Phoca fœtida*, in which the degree of ossification corresponds nearly with the general growth.

There is no doubt that *Phoca caspica* and *Ph. fœtida*, although different (cf. Radde, 'Reisen S. O.-Sibirien,' i. p. 296), are very closely related*, and in the opinion of many authors they should be regarded as varieties of one and the same species. Unfortunately, hitherto, so far as I know, only their external and cranial characters have been studied, but in the other skeletal parts there may be found some features which may throw more light on the question of their relation to each other. So it will be seen that *Phoca caspica*, although land-locked, presents itself as an intermediate form between *Ph. fœtida* and *Ph. grænlandica*, which latter, from its habitat, as is known, has received its synonymic name *oceanica*.

In most of the cranial characters, and those of the chief importance, as, for instance, in the form and direction of the cristæ frontales externæ (linæ semicirculares), in the breadth of the interorbital septum, in the form and connexions of the nasal bones, it is easy to see that *Phoca grænlandica* comes midway between *Ph. vitulina* and *Ph. fœtida*, and that *Ph. caspica* is intermediate between *fœtida* and *grænlandica*. Still more is this last fact to be observed in the characters of the pelvis and the hind limb; but here *Phoca grænlandica* and *Ph. caspica* in many respects form a group together, distinctly separated from the other two species, for besides the above-named proportions of tibia and femur, in the adult state they both have the tibia very much longer than the pelvis as well as than the skull, and their foramina obturatoria are proportionately longer and narrower, always (at least in the adult state) longer than the length of the pelvis in front of them. The most evident specific differences between *caspica* and *grænlandica* are to be found in the skull, which in *Phoca caspica* has most of the characters of *Phoca fœtida* save the form of the hind palatal margin, which lacks the sharp median

* As regards the characters cited by the authors as common to *Phoca caspica* and *Ph. fœtida*, I will only remark that the tuberculum anteorbitale is sometimes wanting in both these species.

angle, thus presenting an intermediate state between *fastida* and *grænlandica*.

Now, as the cranium is missing in our subfossil skeleton, there will always be some uncertainty in the determination of the species; but I think there are still some hints of systematic value which refer the bones to *Phoca grænlandica*. So far as I can see, the pelvis, as compared with the tibia, is shorter in *caspica* than in *grænlandica* as well as in the subfossil skeleton*, and in the former the metatarsals and the phalanges digitorum are a little thinner and distally more narrowed†. These differences indeed are slight, but as they are consistent with the previous occurrences of *Phoca grænlandica* in our glacial deposits, in accordance with them we may determine our subfossil bones as belonging to the Greenland seal. Nevertheless these bones justify us in drawing attention to the fact that *Phoca caspica* is more nearly allied to *Phoca grænlandica* than to any other species.

XXXVI.—Descriptions of new Species of the Genus *Lycænesthes*. By A. G. BUTLER, Ph.D.

WHILST working out the Lycænidæ of the genus *Lycænesthes* I have come across several species which have been confounded with known forms and require to be defined and named.

* The length of the pelvis, so far as can be seen from our collections, in *caspica* is less, in *grænlandica* and in the subfossil skeleton more than 90 per cent. of the length of the tibia.

† The least breadth of the first metatarsal in *caspica* is less, in *grænlandica* and in the subfossil skeleton more than 13 per cent. of its length, and the least thickness of the same bone in *caspica* is less, in the subfossil skeleton and in *grænlandica* more than 12 per cent. of its length. The breadth of the distal end of the fifth metatarsal in *caspica* is less than 19 per cent., in the other two more than 20 per cent. of its length; the least breadth of the same bone in the former is less, in the two latter more, than 15 per cent., and the least thickness in the former is less, in the two latter more, than 12 per cent. of its length. As to the first phalanx of the first digit, the breadth at the middle of the length of the diaphysis in *caspica* is less, in *grænlandica* and in the subfossil skeleton more, than 14 per cent.; the thickness at the same point in the former is less, in the two latter more, than 9 per cent. of the length of the bone. The first phalanx of the fifth digit has the breadth at the middle of the length of the diaphysis in *caspica* less, in *grænlandica* and in the subfossil skeleton more, than 14 per cent.; and the thickness at the same point in the former less than 11 per cent., in the two latter more than 12 per cent. of the length of the bone.

Hewitson described his *Lycænesthes liodes* from a specimen in his collection obtained from the Gaboon by Rogers; this specimen, excepting for the narrowness of the bands on the under surface, corresponds pretty closely with a single male in the Museum series from Zomba, but is certainly distinct from the South-African species which usually represents it in collections; oddly enough, Prof. Aurivillius neither gives Gaboon nor Nyasaland as localities of Hewitson's species, but appears to believe it to be strictly confined to South Africa and Madagascar. Three species occur in Nyasaland—*L. liodes*, the South-African species, and an allied form with very elongated secondaries (of which we only possess one imperfect female).

The ground-tint of brown in typical *C. liodes* is more golden bronze than in the southern insect, the markings below are browner; in the primaries *the belt across the disk is broken up into three subparallel and nearly equal divisions which are placed angle to angle*, whereas in the southern species the two upper divisions are united into a continuous sub-angulated band; below the costal vein towards the base of the secondaries is a well-defined black spot with white margin, and in the Zomba male the first division of the discal band is nearly black; in the southern insect there are no black costal spots. As a matter of fact the true *L. liodes* is quite as close, if not closer, to typical *L. adherbal* (*Hewitsoni*, Auriv.) from the West Coast than to the South-African insect. My *L. adherbal* is the eastern representative of the species, and will retain Trimen's name of *L. lunulata*.

The *L. liodes* of Trimen and others thus requires a name, and may be called *L. definita* from the very dark discocellular and discal markings on the upper surface of the females; we have it from the Cape, Grahamstown, Estcourt, Karkloof, Tugela, Nyasa, and Machakos.

Somewhat allied to the latter, but perhaps quite as much so to *L. larydas*, is a fifth species which I found mixed up with *L. liodes*:—

Lycænesthes Crawshayi, sp. n.

Above bronzy brown with a faint lilac gloss; outer margin narrowly rufous brown; fringe pale brassy brown, the tails and fringe on inner border of secondaries pure white; on the under surface the pattern agrees pretty closely with that of *L. larydas*, but is altogether weaker, greyer, and without black blotches; the ocellated spots have a broader orange zone, but are only sprinkled externally with green metallic scales. The female is generally more ashy and less promi-

nently varied with white, but shows the dark under-surface markings more distinctly than in that sex of *L. larydas*; the ground-colour below is of a pearl-ash tint, rendering the darker markings less prominent than in the allied species.

Expanse of wings, ♂ 28, ♀ 31 millim.

Nyasaland (*Johnston & Dewar*).

Lycænesthes amboinensis, sp. n.

The male nearly approaches *L. emolus*, but is of a more satiny lavender colour, with the usual slender blackish marginal line; the secondaries with a slender greyish submarginal line, preceded by black spots, linear towards apex, but increasing to good-sized spots towards the anal angle: on the under surface the pattern scarcely differs from that of *L. emolus*, but the white edges to the bands are clearer, rendering them more prominent, the submarginal spots on the secondaries are all blackish, and the orange extends into the lunate markings on each side of the largest spot.

Expanse of wings 37 millim.

The female (of which there is an example in the Hewitson series) much resembles a very large *L. Turneri*, but the secondaries are altogether greyer, much less tinted with lavender, the borders of the dark brown submarginal spots being white bounded behind by a brown and then a macular white band: on the under surface the wings are rather more varied with white than in the male, and the outer bands are more sharply defined.

Expanse of wings 37 millim.

Amboina (*J. J. Walker* and *A. R. Wallace*).

This is a larger species than *L. lycænoides* from the same island, and differs in its lavender (not lilac) colour, more satiny gloss, the continuous submarginal black spots followed by a greyish (not white) line on the secondaries, and the better defined and much more regular markings on the under surface. A male in the Hewitson collection from Ceram appears to be referable to Felder's species.

Lycænesthes violacea, sp. n.

♂. Satiny violet above, with black marginal line and brown fringe, the base dark, almost black in the secondaries, which also bear a submarginal series of sharply defined black spots, conical towards anal angle; thorax clothed with ashy hairs: on the under surface the pattern nearly resembles that of *L. emolus*, but the secondaries are a little more suffused with silvery blue at the base of the abdominal fold, and the

submarginal spots between the tails are all surmounted by deep orange Λ -shaped caps; only the spot on the inferior median interspace is intensely black, all the others are brown.

Expanse of wings 32 millim.

St. Aignan Island, Louisiades (*A. S. Meek*).

Lycenesthes aruana, sp. n.

♂. Very like a large *L. emolus* on both surfaces, but the secondaries above with well-defined black submarginal spots as in *L. amboinensis*: on the under surface the orange-bordered spot of the secondaries is much larger than in *L. emolus*, but otherwise the markings are extremely similar.

Expanse of wings 36 millim.

♀. This sex may be distinguished at a glance from the female of *L. emolus* by the possession of a large white patch on the upper surface of the primaries as in *Philiris intensa* from the same island: under surface generally whiter than *L. emolus*, but otherwise similar.

Expanse of wings 36 millim.

♂, Aru (*Wallace*): B. M. ♀, coll. Hewitson.

XXXVII.—*On a Collection of Mantidæ from the Transvaal &c. formed by Mr. W. L. Distant.* By W. F. KIRBY, F.L.S., F.E.S., &c.

MOST of the species enumerated in the following list were collected by Mr. Distant in the Transvaal and by Mr. P. Rendall in Nyasaland; a few, however, are from other localities. The Mantidæ are conspicuous insects and fairly well known, and therefore the proportion of new species is not large. There are, however, several quite common species about which much ambiguity exists, owing to the typical specimens not having been figured, and to the omission of important characters in the descriptions.

The collection includes thirty-two species.

ORTHOPTERA.

Mantidæ.

EREMIPHILINÆ.

Chiroptus, Sauss.

1. *insidiator*, Wood-Mason.

2. *maura*, Stål.

Tarachodes, Burm.

3. *pertoides*, Burm.

Pyrgomantis, Gerst.

4. *singularis*, Gerst.

Lygdamia.

5. *capitata*, Sauss.

6. *lenticularis*, Sauss.

MANTINÆ.

- Entella*, Stål.
 7. *Delalandi*, Sauss.
Dystacta, Sauss.
 8. *paradoxa*, Sauss.
Pseudomantis
 9. *zebrata*, Charp.
Tenodera, Burm.
 10. *superstitiosa*, Fabr.
 11. *capitata*, Sauss.
Sphodromantis, Stål.
 12. *gastrica*, Stål.
Rhombodera, Burm.
 13. *scutata*, Karsch.
Mantis, Linn.
 14. *sacra*, Thunb.
 15. *pia*, Serv.
Hoplocorypha, Stål.
 16. *galeata*, Gerst.
Miomantis, Sauss.
 17. *fenestrata*, Fabr.
 18. *monacha*, Fabr.
 19. *semialata*, Sauss.
 20. *Savignyi*, Sauss.
Cibura, Stål.
 21. *humeralis*, Sauss.
Solygia, Stål.
 22. *Distanti*, sp. n.

CREOBOTRINÆ.

- Oxyphilus*, Serv.
 23. *capensis*, Sauss.
Sibylla, Stål.
 24. *pretiosa*, Stål.
Phyllocrania, Burm.
 25. *paradoxa*, Burm.
 26. *insignis*, Westw.
Pseudocreobotra, Sauss.
 27. *Wahlbergi*, Stål.
Harpagomantis, nom. nov.
 28. *tricolor*, Linn.
Acanthomantis, Sauss. & Zehntn.
 29. *Rendalli*, sp. n.

VATINÆ.

- Papa*, Stål.
 30. *undata*, Fabr.
Danuria, Stål.
 31. *Thunbergi*, Stål.

EMPUSINÆ.

- Hemiempusa*, Sauss. & Zehntn.
 32. *capensis*, Burm.

EREMIAPHILINÆ.

1. *Chiropus insidiator*.

Tarachodes insidiator, Wood-Mason, Journ. Asiatic Soc. Bengal, li. p. 22 (1882); Cat. Mant. p. 28 (1889).

1, Barberton (*P. Rendall*).

Nyasa (*W. M.*); Somaliland (*Lort Phillips*); Voi, British East Africa (*C. S. Betton*). *B. M.*

2. *Chiropus maura*.

Chiropacha maura, Stål, (Efvers. Vet.-Akad. Forh. xv. p. 168 (1856).
Chiropacha puncta, Sauss. Mém. Soc. Genève, xxi. p. 219 (1871).

1, Zomba (*P. Rendall*).

Natal (*St. & Sauss.*); Lake Nyasa (*B. M.*: coll. *Thellwall*).

3. *Tarachodes perlouides*.

Tarachodes perlouides, Burm. Handb. Ent. ii. p. 529 (1839).

3, Pretoria (*W. L. D.*).

Cape of Good Hope (*Burm.*); Murchison Range, Transvaal (*B. M.*: coll. *C. R. Jones*).

4. *Pyrgomantis singularis*.

Pyrgomantis singularis, Gerst. Arch. f. Nat. xxxv. p. 211 (1869);
 Sauss. Mitth. schweiz. ent. Ges. iii. p. 222 (1870); Mém. Soc.
 Genève, xxi. p. 177 (1871); Westw. Rev. Mant. p. 3, pl. xiv.
 figs. 4, 5 (1889).

2, Pretoria (*W. L. D.*).

Between Mombas and Wanga (*Gerst.*); Natal (*Gueinzus*);
 Zululand (*W. H. Heale*); Pirie Bush, S. Africa (*A. N. Stenning*). B. M.

A curious species, with a long pointed cone-shaped head
 like *Pseudorhynchus* or *Tryxalis*.

5. *Lygdamia capitata*.

Chiropacha capitata, Sauss. Mitth. schweiz. ent. Ges. iii. p. 61 (1869);
 Mém. Soc. Genève, xxi. p. 18, pl. iv. fig. 2 (1871).

Lygdamia capitata, Stål, Bihang Vet.-Akad. Handl. ix. (10) p. 17
 (1877).

3, Pretoria (*W. L. D.*); 1, Picnaars River (*W. L. D.*);
 1, Zomba (*P. Rendall*); 3, Fort Johnston (*P. Rendall*).

Zanzibar (*Brunner*); Durban, Natal (*Marshall*); British
 East Africa (Maziwa, Matata, and Manuga), March 14 and
 April, 1897 (*C. S. Betton*). B. M.

6. *Lygdamia lenticularis*.

Chiropacha lenticularis, Sauss. Mém. Soc. Genève, xxiii. p. 11, pl. ix.
 fig. 18 (1873).

Lygdamia lenticularis, Stål, Bihang Vet.-Akad. Handl. iv. (10) p. 17
 (1877).

1, Picnaars River (*W. L. D.*).

Natal (*Leipzig Museum*). Appears to be a much scarcer
 species than the last.

*MANTINÆ.*7. *Entella Delalandii*.

Gonypeta Delalandii, Sauss. Mém. Soc. Genève, xxi. p. 55, pl. iv.
 figs. 12, 13 (1871).

2 ♂, Zomba (*P. Rendall*); 1 ♂, Fort Johnston (*P. Ren-*
dall).

Cape (*Paris Museum*).

Distinguished from the closely allied *E. nebulosa*, Serv.
 (nec Thunb.), which is in the Natural History Museum from
 Estcourt, Natal (*Marshall*), by the absence of the black
 transverse lines on the face, which are so conspicuous in
E. nebulosa.

8. *Dystacta paradoxa*.

Dystacta paradoxa, Sauss. Mém. Soc. Genève, xxi. p. 323 (1871), xxiii p. 80, pl. viii. fig. 16 (1873); Stål, Bihang Vet.-Akad. Handl. iv. (10) p. 51 (1877).

2, Barberton (*P. Rendall*).

Cape and Damaraland (*Brunner*); Lake Nyasa and Delagoa Bay. B. M.

9. *Pseudomantis zebata*.

Mantis zebata, Charp. Orth. t. xxxix. (1845 p.).

Pseudomantis zebata, Sauss. Mém. Soc. Genève, xxi. p. 37 (1871)

Hierodula snaris, Branca. Jahresh. Ver. Trencsen, 17/18, p. 247, pl. vii. fig. 7 (1895).

2, Pretoria (*W. L. D.*); 1, Delagoa Bay (*W. L. D.*).

Cape (*Charpentier*, and *Paris Museum*). Murchison Range, Transvaal (*C. R. Jones*); Zululand (*Rev. W. H. Heale*). (B. M.)

This is one of the prettiest species of Mantidæ, and does not appear to be very abundant.

10. *Tenodera superstitiona*.

Mantis superstitiona, Fabr. Spec. Ins. i. p. 348. n. 17 (1781).

Tenodera superstitiona, Sauss. Mém. Soc. Genève, xxi. pp. 99, 296 (1871).

1, Fort Johnston (*P. Rendall*).

Originally described from South Africa. Common throughout Ethiopian Africa, and a large part of Southern Asia and the Archipelago, as far as Australia.

11. *Tenodera capitata*.

Tenodera capitata, Sauss. Mitth. schweiz. ent. Ges. iii. p. 69 (1869); Mém. Soc. Genève, xxi. pp. 95, 293 (1871).

2, Barberton (*P. Rendall*); 1, Zomba (*P. Rendall*).

East Central Africa (*Scott Elliot*) and another from the Congo (*A. Curror*). B. M.

This species may easily be recognized by the dentated front coxæ.

12. *Sphodromantis gastrica*.

Mantis gastrica, Stål, Cefv. Vet.-Akad. Förh. xv. p. 302 (1858).

Hierodula gastrica, Stål, Bihang Vet.-Akad. Handl. iv. (10) p. 57 (1877); Sauss. & Zehntn., Grandid. Madag. xxxiii. p. 187 (1895).

Hierodula bicarinata, Sauss. Mitth. schweiz. ent. Ges. iii. p. 68 (1869); Mém. Soc. Genève, xxi. p. 74, pl. v. fig. 22 (1871).

Hierodula (Sphodromantis) bicarinata, Wood-Mason, Journ. Asiatic Soc. Bengal, li. p. 28 (1882).

Mantis Kersteni, Gerst. Arch. f. Nat. xxxv. p. 209 (1869); Von der Decken, Reisen, iii. (2) p. 13 (1873) (nec Stål, nec Sauss. & Zehntn.).

3, Pretoria (*Distant*); 5, Barberton (*P. Rendall*); 1, Salisbury, Mashonaland (*Marshall*); 1, Zoutpansberg (*Kæssner*); 1, Angola (*Monteiro*).

A common species throughout Eastern and Southern Africa, if not also in West Africa. Some of Mr. Distant's specimens are brown instead of green, and one is pink; but he assures me that they were so coloured when captured.

Geistæcker's *M. Kersteni* appears to be a synonym of this species and not to belong to that to which Stål afterwards applied the name. The latter may be known by having two large round white spots on the inner side of the front coxæ.

13. *Rhombodera scutata*.

Rhombodera scutata, Karsch, Ent. Nachr. xviii. p. 6 (1892).

1, Fort Johnston (*P. Rendall*).

Angola and Malange (*Karsch*); Tanganyika, Fwambo, and Zambesi. (*B. M.*)

14. *Mantis sacra*.

Mantis sacra, Thunb. Mém. Acad. Pétersb. v. p. 289 (1815).

2, Pretoria (*W. L. D.*).

15. *Mantis pia*.

Mantis pia, Serv. Ins. Orth. p. 193 (1839).

2, Pretoria (*W. L. D.*); 2, Fort Johnston (*P. Rendall*); 1, Barberton (*P. Rendall*).

This insect is usually considered synonymous with the last. It differs from it in the large black spot at the base of the front coxæ being unicolorous; in *M. sacra* it has a large red or yellow centre.

16. *Hoplocorypha galeata*.

Mantis (? *Danuria*) *galeata*, Gerst. Arch. f. Nat. xxxv. p. 210 (1870); Von der Decken, Reisen, iii. (2) p. 16 (1873).

Parathespis galeata, Sauss. Mém. Soc. Genève, xxi. p. 135 (1871), xxiii. p. 63 (1873).

Hoplocorypha macra, Stål, Cefvers. Vet.-Akad. Förh. xxviii. p. 388 (1871).

1, Pretoria (*W. L. D.*).

A widely distributed species in Southern and Eastern Africa.

17. *Miomantis fenestrata*.*Mantis fenestrata*, Fabr. Spec. Ins. i. p. 349. n. 13 (1781).*Miomantis fenestrata*, Sauss. Mém. Soc. Genève, xxi. p. 119 (1871).

5 ♂ ♀, Pretoria (W. L. D.).

East London, Natal, Knysna, Transvaal, Uganda. (B. M.)

A common species.

18. *Miomantis monacha*.*Mantis monacha*, Fabr. Mant. Ins. i. p. 228. n. 24 (1781).*Mantis vitrata*, Oliv. Encycl. Méth. vii. p. 639. n. 1 (1792).*Mantis forficata*, Stoll, Mantes, pl. i. fig. 2 (1813 ?).

1, Fort Johnston, Nyasaland (P. Rendall).

This is a larger and stouter species than *M. fenestrata*. The specimen before me agrees well with Stoll's figure, which is said to be taken from a Cape specimen. There is a conspicuous yellow line above the green subcostal stripe on the fore wings, and on the inside of the front femora are two black dots, near together, opposite the commencement of the spines. In *M. fenestrata* there is almost always a third spot at the base of the femur.

19. *Miomantis semialata*.*Miomantis semialata*, Sauss. Mém. Soc. Genève, xxiii. p. 71, pl. viii. fig. 14 (1873).

1, Barberton (P. Rendall).

Apparently the commonest species of the genus at Natal, from whence it was originally described. There is also a specimen from Zomba in the Natural History Museum.

20. *Miomantis Savignyi*.*Miomantis Savignyi*, Sauss. Mém. Soc. Genève, xxiii. p. 69, pl. viii. fig. 15 (1873); Westw. Rev. Mant. pp. 18, 37, pl. x. fig. 1 (1889).

1, Zomba (P. Rendall).

Nubia, Sennaar (Saussure); Cairo (Westwood).

Zululand (Rev. W. H. Heale). B. M.

A widely distributed species, but apparently not common.

21. *Cilnia humeralis*.*Cardioptera humeralis*, Sauss. Mém. Soc. Genève, xxi. pp. 195, 281 (1871).*Cilnia humeralis*, Stål, Bihang Vet.-Akad. Handl. iv. (10) p. 53 (1877).*Mantis latipes*, Stål, Bihang Vet.-Akad. Handl. iii. (14) p. 43 (1875).*Cilnia latipes*, Stål, Cefv. Vet.-Akad. Förh. xxxiii. (3) p. 71 (1876); Bihang Vet.-Akad. Handl. iv. (10) p. 53 (1877).

3, Pretoria (*W. L. D.*); 1, Pine Town, Natal; 5, Barberton (*P. Rendall*).

Ovamba (*Stål*).

This interesting genus stands in nearly the same relation to *Miomantis* that *Sphodromantis* occupies towards *Hierodula*. Stål attempts to discriminate between *latipes* and *humeralis* specifically by a short comparison of the females, but mentions no really satisfactory characters by which they can be distinguished.

22. *Solygia* (?) *Distanti*, sp. n.

♂.—Long. corp. 56–58 millim.; pron. 17–20; lob. post. pron. 14; tegm. 27; cox. ant. 9, 10; fem. ant. 13–14; tib. ant. (absque ung.) 4–5; fem. post. 19–20.

♀.—Long. corp. 58–69; pron. 20–24; lob. post. 16–18; tegm. 6–9; cox. ant. 11, 12; fem. ant. 12; tib. ant. (absque ung.) 4–5.

Male.—Testaceous. Head narrow, transverse, Agrioniform, yellowish behind, dark brown from below the acute carina on the vertex to the antennæ, which stand on a testaceous stripe; below the antennæ are two dark transverse lines, the uppermost darkest; the rest of the head testaceous; antennæ about as long as the pronotum, testaceous, black above beyond the first third of their length, except at the joints.

Pronotum speckled and indistinctly lined on the sides with black; the lateral carina is black, edged above with a pale line. Sides scarcely denticulated, slightly expanded above the front coxæ. Femora and terminal half of coxæ lined with black.

Front femora with 4 spines on the outer and many on the inner side; 3 discoidal spines, which latter are spotted with black at the base.

Middle and hind legs very long and slender.

Wings extending nearly to the extremity of the abdomen; tegmina and wings hyaline, with brown nervures; costal area yellowish (or green?), edged below with a dark line.

Female similar, but stouter and paler, especially on the head, where there is only one distinct slender black transverse line, below the antennæ. Tegmina extending to above the origin of the middle coxæ; black, with the base and costal third yellowish. The largest specimen has a rather indistinct dark double median line running along the upper surface of the abdomen.

1 ♂, Barberton (*P. Rendall*).

Three other specimens (1 ♂, 2 ♀) collected by Rev. W. H. Heale in Zululand are in the Natural History Museum and have been used in drawing up the above description.

Thespis sulcatifrons, Serv., and *Mantis* (*Photina*) *agrionina*, Gerst., are probably allied to this species.

I do not know the type of *Solygia*, and refer the present species to that genus with some doubt. *S.* (?) *Distanti* considerably resembles the figure of *Stenopyga extera*, Karsch, and may belong to the same genus.

CREOBOTRINÆ.

23. *Oxyphilus capensis*.

Oxyphilus capensis, Sauss. Mém. Soc. Genève, xxi. p. 169, pl. vi. figs. 52, 52a (1871).

Oxyphilus annulatus ♀, Sauss. Mitth. schweiz. ent. Ges. iii. p. 223 (1870).

Oxyphilus strigipennis (Bates), Westw. Rev. Mant. p. 44, pl. ix. fig. 7, pl. xiii. fig. 1 (1890).

1, Pienaars River (*W. L. D.*).

Cape of Good Hope (Paris Museum); Eastern Karoo, Knysna (B. M.).

24. *Sibylla pretiosa*.

Sibylla pretiosa, Stål, (Efvers. Vet.-Akad. Forh. xiii. p. 168 (1856); Sauss. Mém. Soc. Genève, xxi. p. 332 (1871).

1, Lydenburg District (*Zutrzenka*); 1, Zomba (*P. Rendall*). Natal, Murchison Range. (B. M.)

25. *Phyllocrania paradoxa*.

Phyllocrania paradoxa, Burm. Handb. Ent. ii. p. 549 (1839).

2, Pretoria, ♂ ♀ (*W. L. D.*).

Cape (*Burmeister*). Natal, Zululand: B. M.

26. *Phyllocrania insignis*.

Phyllocrania insignis, Westw. Arc. Ent. ii. p. 51, pl. lxii. fig. 1 (1848); Rev. Mant. p. 44, pl. xii. fig. 7 (1869); Sauss. Mém. Soc. Genève, xxi. pp. 174, 327 (1871).

2, Barberton, ♂ ♀ (*Goodall & P. Rendall*); 2 ♂, no locality.

Sierra Leone (*Westwood*); Cazamanca (*Saussure*). Slave Coast, Guinea; Tanganyika; Pirie Bush, S. Africa. (B. M.)

Appears to be a common species throughout Ethiopian Africa.

27. *Pseudocreobotra Wahlbergi*.

Pseudocreobotra Wahlbergi, Stål, Bihang Vet.-Akad. Handl. iv. (10) p. 85 (1877).

Harpax ocellata, Serv. (nec Beauv.) Ins. Orth. p. 158 (1839).

2, Barberton (*P. Rendall*).

Caffraria, Zanzibar (*Stål*). Natal, Nyasa (B. M.)

One of the largest and handsomest species of the group.

HARPAGOMANTIS, nom. nov.

|| *Harpax*, Serv. Ann. Sci. Nat. xxii. p. 49 (1831); Ins. Orth. p. 157 (1839); Burm. Handb. Ent. ii. p. 550 (1839); Sauss. Mém. Soc. Genève, xxi. (1) p. 151 (1871).

The name *Harpax* is preoccupied in Mollusca (Park, 1811).

28. *Harpagomantis tricolor*.

Gryllus Mantis tricolor, Linn. Syst. Nat. (ed. x.) i. p. 426. n. 9 (1858).

Harpax tricolor, Serv. Ins. Orth. p. 158 (1839); Sauss. Mém. Soc. Genève, xxi. p. 151 (1871).

3 ♂, 2 ♀, Pretoria (*W. L. D.*); 1 ♀, Zoutpansberg (*Kossner*); 1 ♀ (discoloured), Barberton (*P. Rendall*); 1 ♀, no locality; 1 ♀, Albany Museum, Graham's Town, March 5.

Natal, King William's Town, N'Gami Country, Transvaal, Mashonaland. (B. M.)

A common and widely distributed species. The sexes differ considerably.

29. *Acanthomantis Rendalli*, sp. n.

Long. corp. 15 millim.; pron. 4 millim.; lat. pron. 2 millim.; exp. tegm. 34 millim.

Female.—Brown, slightly varied with pink, and on the legs with blackish; eyes large, mamillated; back of head concave and raised into a projecting angle on each side behind the eyes. Tegmina and wings hyaline, the costal area darker and spotted with brown; hind margins brownish, especially on the upper half of the wings; tegmina subparallel, apex forming a very obtuse angle above the middle of the hind margin; longitudinal nervure irregularly and unsymmetrically spotted with blackish, otherwise concolorous. Wings with the longitudinal nervures and the transverse nervures on the upper third yellowish, the rest concolorous.

1, Fort Johnston (*P. Rendall*).

I was unwilling to leave this interesting species undescribed, though it is founded only on a single specimen, not in the best condition.

It appears to be quite distinct from *A. aurita*, Sauss. & Zehntn., from Madagascar, the type of the genus.

VATINÆ.

30. *Popa undata*.

Mantis undata, Fabr. Ent. Syst. ii. p. 19. n. 28 (1793), Charp. Orth. tab. xxxviii. (1845).

Theoclytus (?) undata, Serv. Ins. Orth. p. 152 (1839).

Popa undata, Sauss. Mém. Soc. Genève, xxiii. p. 79 (1873), Sauss. & Zehntn., Grandid. Madag. xxiii. p. 233 (1895).

2, Pretoria, ♂ ♀ (*W. L. D.*); 3 ♀, Barberton (*P. Rendall*); 1 ♂, Zomba (*P. Rendall*).

A common species in South Africa and Madagascar.

31. *Danuria Thunbergi*.

Danuria Thunbergi, Stål, Öfv. Vet.-Akad. Forh. xiii. p. 169 (1856), Sauss. Mém. Soc. Genève, xxi. p. 320, pl. vii. figs 66, 67 (1871), Sauss. & Zehntn., Grandid. Madag. xxiii. p. 228 (1895).

2, Barberton, ♂ ♀ (*P. Rendall*).

A common species in Madagascar and Southern and Eastern Africa.

EMPUSINÆ.

32. *Hemiempusa capensis*.

Empusa capensis, Burm. Handb. Ent. p. 547. n. 7 (1839); Sauss. Mém. Soc. Genève, xxiii. p. 38 (1873).

Empusa purpureipennis, Serv. Ins. Orth. p. 145 (1839).

Idolomorpha (Hemiempusa) capensis, Sauss. & Zehntn., Grandid. Madag. xxiii. p. 242, pl. x. fig. 43 (1895).

1 ♂, Pine Town, Natal; 1 ♂, Pienaars River (*Thompson*); 1 ♀, Barberton (*P. Rendall*); 1 ♀, Angola (*Monteiro*). Cape of Good Hope (*Saussure*).

A common and widely distributed species.

XXXVIII.—On Mammals collected by Lieut.-Colonel W. Giffard in the Northern Territory of the Gold Coast. By W. E. DE WINTON.

THE mammals contained in the following list were obtained by Lt.-Col. (then Capt.) W. Giffard, while serving in an expedition with Lt.-Col. H. P. Northcott lately operating in the northern territory of the Gold Coast. Several of the smaller species are new to science, while all add to our knowledge of the genera to which they belong. The specimens are in excellent condition and carefully labelled, showing

the care and trouble that was taken in making the collection. Considering the nature of the operations, which kept the column constantly on the move, the number of specimens brought home is very creditable.

Colonel Giffard has presented the whole of his collection of small mammals to the British Museum, and Col. Northcott has also added some of his larger trophies and a number of birds to the National Collection.

Epomophorus macrocephalus.

♂ ♀ ♀, Gambaga, August 20, 1898.

"Lives in bamboos. Eyes much resemble catseye-stone."

Epomophorus pusillus.

♂, Gambaga, 1300 feet, 25th July, 1898.

Rousettus stramineus.

♂, Moshi, 1st July, 1898.

"One colony seen: lives on bare trees; flies by day."

Megaderma frons.

♂, White Volta River, 700 feet, 12th June, 1898*.

Nycteris macrotis.

♂, Fra fra Country, 500 feet, 27th Jan., 1899.

"Found in huts."

Nycteris, sp.

♀, Karaga, 1200 feet, 11th May, 1898.

"Killed in burning town."

This specimen is too young for certain determination; it is probably *N. hispida*.

Chalinolobus variegatus.

♂, Gambaga, 1st Sept., 1898.

This pretty leaf-winged bat has a wide distribution. There are in the British Museum specimens from Angola, Zambesi River, and Uganda; but in none of these localities is the species found to be plentiful.

* In this Journal for December 1897, p. 524, I described a bat as *Rhinolophus micaccus*; but on receipt of good specimens in spirit I at once recognized in my species *Hipposiderus cyclops*, Temm.

Scotophilus nigritellus, sp. n.

Size smaller than *S. nigrita* (*S. borbonicus*), but apparently agreeing with that species in general form. The colour above is dark olive, the bases of the fur lemon-yellow. This colour is somewhat nearly matched in occasional specimens of both *S. nigrita* and the Indian species *S. Kuhli*; but size alone is sufficient to distinguish it from either of these forms.

The ears and tragus, also the teeth and skull, closely resemble those of *S. nigrita*, but are very much smaller in size.

Type no. 99. 6. 15. 9 in British Museum.

♂, Gambaga, 1300 feet, 9th Jan., 1899.

Measurements (taken in the flesh):—

Head and body 70 millim.; tail 37; hind foot 8; ear 15; forearm 44.5; thumb with claw 5.5.

Measurements of skull:—

Greatest length 18 millim.; greatest breadth 12.9; across brain-case 9; between orbits 6.5; tip to tip of canines 5.5; tip to tip of incisors 3.5; front of canine to back of molar series 6.1; front of palate to foramen magnum, middle line, 12; mandible, greatest length 12.5, height at coronoid 5.5.

Tragus long and pointed as that of *S. nigrita*.

Canines rounded in front. Incisors very slightly convergent at their tips. First premolar in lower jaw small, barely half the length of second.

Scotophilus Schlieffeni.

♂ ♀, 4th Feb., 1899, Fra fra Country, 500 feet.

"Found in huts."

Scotophilus hirundo, sp. n.

Colour of the body above mouse-grey, beneath silvery white; wings and interfemoral membrane wholly dark, with perhaps the exception of the postcalcaral lobe, which in the dry skin appears pale grey. The tragus is short and rounded, spatulate in form as in *S. albofuscus*, with which species the dentition also closely agrees.

Type no. 99. 6. 15. 8 in British Museum.

Sex not known. Gambaga, 1300 feet, 30th Nov., 1898.

Measurements (taken from the dry skin):—

Head and body c. 43 millim.; forearm 31.5; thumb 5.3.

Measurements of skull:—

Greatest length 14.5; across brain-case 9; between

orbits 6·9; tip to tip of canines 4·1; tip to tip of incisors 1·9; front of canine to back of molar series 5·2; front of palate to foramen magnum 10; mandible, greatest length 10·2, height at coronoid 4·2.

The canines have a deep broad groove in front, the tips diverging; the incisors are strongly convergent. The lower incisors are not crowded, but grow in the direction of the jaws. The first premolar in the lower jaw is large and longer than the second premolar.

In all important characters this new species closely resembles *S. albofuscus*, the colour of the fur and wing-membranes alone distinguishing the two species. There can be no doubt that these two species should be placed in a distinct genus from *S. nigrata* and company, the form of the canine teeth alone being a sufficient reason; but provisionally I follow Mr. Thomas (Ann. Mus. Genov., Feb. 1890, p. 3) in placing them in this genus until the whole of this group of bats shall have been worked out.

Crocidura (Cr.) Giffardi.

♀. Moshi, 600 feet, 30th June, 1898.

"Found dead."

This fine species was described by the present writer in this Journal (ser. 7, vol. ii. p. 484).

It is not only the largest member of the division of the genus to which it belongs, but is perhaps the richest-coloured shrew known, the fur being glossy and as dark as the richest seal-fur as prepared in accordance with the fashion of the day.

In the original description, the locality given on the seventh line from the bottom of the page, "on the way to Kumassi," should read "some 500 miles N.E. of Kumassi near Wagadugu." The name of the district seems variously spelt Morsi, Mossi, or Moshi, the last being that found on the most recent maps.

Xerus erythropus.

♂, Gambaga, 28th Dec., 1898.

"Shot among rocks."

Funisciurus annulatus.

♂, Gambaga, 20th August, 1898, 1300 feet.

"Shot in tree. Eye hazel."

Note.—In this Journal (ser. 6, vol. xvi., August 1896, p. 107) I described a squirrel from Monbuttu under the name of *Sciurus Emini*,

having overlooked the fact that this name had been used by Stuhlmann in his book 'Mit Emin Pasha,' p. 320, for the little striped squirrel previously described under the name of *S. Boehmi* by Reichenow. My original name for the Monbutt squirrel therefore having found its way into the synonymy of another species, I now propose for it the name of *Funisciurus akka*.

Funisciurus substriatus, sp. n.

Size rather larger than *S. poensis* and the tail more bushy; closely resembling that species in colour, but the yellow rings in the fur are broader and more ochre-coloured; the sides of the face, bases of the ears, and underparts also ochraceous and not greenish yellow. On each side there are faint indications of a single pale stripe, scarcely so well defined as that found in *S. Bayonii*. From the latter species the most evident distinction is the much paler ochre-coloured underparts and the coarser annulation of the fur.

The size of the feet is a good character by which this new species may at all times be distinguished from examples of *S. poensis*, the feet of the latter being so very much smaller.

♂, April 10, 1899, near Kintampo, Gold Coast hinterland, 800 feet.

Type no. 99. 6. 15. 12 in British Museum.

Collector's measurements (taken from the animal in the flesh):—Head and body 160 millim.; tail 195; ear 15; hind foot 39. The measurement of the tail seems to include the hair, which is about 30 millim. in length.

Skull: greatest length 42 millim.; greatest breadth 24; across brain-case 19; narrowest interorbital constriction 11; length of nasals 10.5; basal length 34.5; back of incisors to back of palate 16.5; incisive foramina 3; length of molar series 7.5; breadth outside *ms.*¹ 9.5; antero-posterior length of auditory bulla 8.5.

Mandible: greatest length, tip of incisors to condyle, 28.5; bone only 24; height, coronoid to angle, 15.3.

In size and proportions this squirrel very nearly resembles *S. lemniscatus*, which may be found to be its nearest ally. The skull and dentition of these two species resemble each other very closely—in fact, there seem no characters to satisfactorily distinguish them, being of the same size, and both have laminated hypsodont molars, in no way resembling the tuberculate brachydont molars of *S. poensis*.

This new species therefore will probably be found to be a plain-coloured local representative of the distinctly striped Camaroon species *S. lemniscatus* and *S. isabella*. The teeth

of *S. Bayonii* from Angola have not yet been described, all the specimens hitherto received having been flat skins without skulls.

Gerbillus, sp.

♂, Gambaga, 4th Jan., 1899.

Herr Matschie has assigned specimens of Gerbilles from the neighbouring district in the north of Togoland to *G. leucogaster*, Pet.; but this Gambaga specimen does not belong to that species, but agrees with specimens in the British Museum from Monbuttu which I take to be *G. macropus*, Heuglin. But further specimens are required from the type localities of these older authors before this group of animals can be satisfactorily worked out.

Mus erythroleucus.

♂, Gambaga, 1300 feet, 20th May, 1898.

"Trapped in bush."

Arvicanthis, sp.

♂, Fra fra Country, 500 feet, 5th Feb., 1899.

This single specimen is rather young, but it seems to agree with half-grown specimens of *A. abyssinicus*, and it is quite probable that this field-rat would extend across Africa in this latitude without much variation.

Bubalis major.

♂, between Gambaga and Kintampo.

"From Yabum (on a modern map) to within 50 miles of Kintampo they are fairly numerous."

This is the first skin of the West-African Hartebeeste which has reached the Museum. The general colour is almost uniform dull chestnut; there is a distinct pale mark on the forehead from eye to eye; the only dark markings are dark brown or black stripes on the front of the legs, reaching from the hoof to about 2 inches above the knee on the fore legs, and dying away before reaching the height of the hock on the front of the hind legs. The tail has a black tuft. The colouring of the animal is much like that of *B. Lichtensteini*, but the darker saddle-area is not clearly defined, the colour shading gradually off excepting on the buttocks.

Cephalophus rufilatus.

♂ ♀, Gambaga, March 1899.

"Not uncommon; very solitary in its habits; never seen more than 100 yards from water."

The adult horns of this little Duiker were until quite lately unknown: the male specimen may be considered an unusually large one; it is an old animal, and the horns, although much worn down at the tips, are very much longer than any other known head.

This specimen was exhibited before the Zoological Society, and is figured in part iii. of its 'Proceedings' for this year, p. 772.

Ourebia nigricaudata.

♀, Gambaga.

Common about Gambaga, but not observed far to the south of that place.

Hippotragus equinus gambianus.

♂ ♂, Tumu, Gurunsi, 9 miles south of 11° N.

These Roan Antelopes were obtained by Lieut.-Col. H. P. Northcott, who has presented them to the British Museum, where one of the heads has been mounted. The general colour of the younger specimen is much redder than any specimens which I have seen from other parts of Africa, this bright colour reaching down to the feet.

The older specimen is very pale and tawny in colour and lacks the bluish grizzling which is generally seen in the South-African form.

Col. Giffard writes as follows:—"Roan I saw in Dagomba, some 40 miles S. of Gambaga, also at Gambaga in March, when I shot two; also in uninhabited country about 50 miles from Yabum towards Kumassi."

XXXIX.—*Some apparently undescribed Species of Heterocera from the Transvaal.* By W. L. DISTANT.

THE Moths here described will be all figured in my 'Insecta Transvaaliensia,' and they refer to species recently received from that often beautiful, always interesting, but now most unhappy country.

Fam. Lymantriidæ.

Dasychira confinis, sp. n.

Head, pronotum, and base of abdomen cretaceous, remaining two thirds of abdomen bright ochraceous; posterior margins of the three basal segments black and with two discal transverse black spots before apex. Antennæ cretaceous, its fringe ochraceous; eyes black, with their basal margins brownish. Body beneath and legs cretaceous; apex of abdomen ochraceous; legs with indeterminate black markings.

Wings above and beneath cretaceous, unicolorous.

Exp. wings 46 millim.

Hab. Transvaal, on the Natal frontier.

Chadisa bicolor, sp. n.

Head, pronotum, and apex of abdomen cinereous; antennæ and abdomen ochraceous; body beneath and legs cinereous, base of abdomen narrowly ochraceous.

Anterior wings cinereous; a lunulate fascia at end of cell and a much waved lineate fascia crossing wing beyond cell, blackish. Posterior wings bright ochraceous; a marginal spot composed of black speckles near anal angle. Anterior wings beneath a little paler than above, with the blackish markings invisible.

Exp. wings 47 millim.

Hab. Transvaal, Pretoria.

Chadisa is an Oriental genus founded on a species from Ceylon; but Sir G. F. Hampson has kindly examined the Transvaal species and pronounced it congeneric.

Heteronygmia flammeola, sp. n.

Head and pronotum griseous, longly pilose, posterior pronotal tuft ochraceous; abdomen ochraceous, with the posterior segmental margins blackish; body beneath and legs ochraceous; tibiæ more or less strongly pilose and griseous; abdomen with central and lateral longitudinal series of subquadrate piceous spots.

Anterior wings saffron-coloured, with a large patch of brown and piceous speckles on inner basal margin; two spots in centre of cell, one beneath cell, some shading beneath apical area of cell, lineate fasciæ (mixed with piceous) at end of cell, and beyond this a much waved linear fascia crossing wing very dark ochraceous; a submarginal outer line of dark brownish speckles, recurved and much angulated at apex;

neuration speckled with dark brownish. Posterior wings pale bright ochraceous. Wings beneath pale ochraceous.

Exp. wings 35 millim.

Hab. Transvaal, Lydenburg District.

Lælia figlina, sp. n.

Body above and beneath, legs, and antennæ pale ferruginous; eyes piceous.

Anterior wings pale ferruginous, the median nervure dark speckled, giving a faint impression of a longitudinal lineate fascia; apical area with some scattered faint dark speckles. Posterior wings greyish white, the outer margin narrowly very pale ferruginous. Wings beneath as above, but posterior wings with the costal area ferruginous.

Exp. wings 33 millim.

Hab. Transvaal, East Central Boundary.

Fam. Eupterotidæ.

Phiala arrecta, sp. n.

Pronotum lacteous; head, antennæ, and abdomen pale ochraceous; body beneath and legs ochraceous; tibiæ and abdomen more or less shaded with piceous, imperfectly seen through the ochraceous pilosity.

Wings lacteous; anterior wings with a few widely scattered black speckles, which coalesce and form a transverse nearly straight submarginal fascia. Wings beneath lacteous, unicolorous.

Exp. wings 45 millim.

Hab. Transvaal, Lydenburg District.

Fam. Notodontidæ.

Desmeocræra basalis, sp. n.

Head, pronotum, and posterior pronotal tuft cinereous; abdomen mouse-coloured; abdomen beneath and legs very pale ochraceous; sternum and pilose covering to legs white; antennæ ochraceous; eyes black, with their anterior and inner margins ochraceous.

Anterior wings griseous, their base obliquely dark cinereous; posterior wings dull greyish white, their extreme outer margin faintly and narrowly pale brownish. Wings beneath dull greyish; anterior wings and costal area of posterior wings tinged with pale brownish.

Exp. wings 50 millim.

Hab. Transvaal, Lydenburg District.

Fam. *Lasiocampidæ*.*Philudoria distincta*, sp. n.

Body above and beneath and legs umber-brown.

Anterior wings umber-brown, crossed by three piceous fasciæ, the first somewhat perpendicular near base, the second convexly oblique passing end of cell, the third submarginal, lineate, and angularly waved. Posterior wings fawn-coloured, with very faint indications of a darker submarginal, lineate, angularly waved fasciæ. Anterior wings beneath pale umber-brown, unicolorous.

Exp. wings, ♂ 30, ♀ 40 millim.

Hab. Transvaal, Johannesburg, Pretoria.

Fam. *Chrysopolomidæ*.*Chrysopoloma varia*, sp. n.

Pronotum umber-brown; head and abdomen ochraceous; body beneath and legs ochraceous; tibiæ with black annulations.

Anterior wings umber-brown, somewhat thickly and irregularly spotted with piceous; extreme outer marginal area almost impunctate. Posterior wings dull ochraceous. Wings beneath pale dull ochraceous, with a few dark speckles on their costal areas.

Exp. wings 45 millim.

Hab. Transvaal, Pretoria.

Chrysopoloma restricta, sp. n.

Pronotum fulvous; head and abdomen ochraceous; abdomen beneath fulvous; sternum and legs ochraceous; tibiæ annulated with black.

Anterior wings fulvous, crossed a little beyond cell by an almost straight, narrow, dark brown fasciæ. Posterior wings pale dull ochraceous. Wings beneath very pale fulvous, unicolorous.

Antennæ pale fuscous.

Exp. wings 45 millim.

Hab. Transvaal, Lydenburg District.

XL.—Notes on the Classification of the Coleopterous Family Rutelidæ. By GILBERT J. ARROW, F.E.S.

THE following notes upon points which have arisen in the course of work upon the collection of Rutelidæ in the British Museum will, I hope, contribute something to the more perfect classification of that beautiful and interesting group of beetles.

The mass of species forming the Central and South-American group of the Antichirides is in much need of generic arrangement. Insects of very diverse characters have been assigned to the genera *Antichira* and *Chlorota*; and although various new genera have been formed from these assemblages, the species have not yet been tabulated, and those remaining in the older groups are little less heterogeneous than before.

A genus *Ptenomela* was described by Bates for the reception of "a considerable number of species which differ constantly from *Antichira* in the form of the mandibles (unarmed externally), from *Thyridium* in the size and shape of the scutellum, which is one fourth the length of the elytra and triangular, with flexuous sides, and from *Chlorota* in the well-developed mesosternal process." The only species mentioned by the author is *gratiosa*, Sharp. With this the following insects are congeneric:—

- | | |
|---|--|
| P. (<i>Thyridium</i>) <i>sodalis</i> , <i>Waterh.</i> | P. (<i>Thyridium</i>) <i>Blanchardi</i> , <i>Kirsch.</i> |
| P. (<i>Chlorota</i>) <i>euchloroides</i> , <i>Murr.</i> | P. (<i>Thyridium</i>) <i>scutellata</i> , <i>Waterh.</i> |
| P. (<i>Antichira</i>) <i>psittacina</i> , <i>Burm.</i> | P. (<i>Thyridium</i>) <i>punctata</i> , <i>Waterh.</i> |
| P. (<i>Dorystethus</i>) <i>glauca</i> , <i>Bll.</i> | P. (<i>Antichira</i>) <i>gonerosa</i> , <i>Waterh.</i> |

Two insects at present left in the genus *Antichira*, viz. *A. puberula* and *A. pilosula* of Waterhouse, should be transferred to *Thyridium*, which is distinguished by the small heart-shaped scutellum, concave on its front margin, into which a rounded lobe from the hinder edge of the pronotum fits.

Antichira sulcipennis, *Waterh.*, has some resemblance to a *Thyridium*, but differs conspicuously, and a new genus must be found for it. The type is the only specimen of this genus known to me. It is a highly peculiar insect with strongly sulcate elytra, very small scutellum, scarcely longer than it is broad, and the prothorax sharply angulated at the sides and without a lateral border. In the last character it differs from every other known member of the present group. The generic diagnosis is as follows:—

ACRASPEDON, gen. nov.

Corpus elongatum. Processus mesosternalis elongatus, apice recte truncatus. Mandibulæ extus bidentatæ. Pronotum lateribus immarginatum, angulatum, angulis fere rectis, margine postico lobatum, lobo truncato. Scutellum parvum, lateribus curvilineatis, quam latum vix longius. Elytra profunde sulcata.

Type: *Acraspedon* (*Antichira*) *sulcipennis*, Waterh., Trans. Ent. Soc. Lond. 1881, p. 543.

Burmeister's Section II. A of the genus *Chlorota* is at present in a very disorganized condition. Lacordaire placed its original members in the now restricted *Antichira*, but related forms have since been described under both names. They make a very heterogeneous collection, agreeing in little but the deeply striate elytra. The insects in question are *C. smaragdula*, *chalconota*, *metallica*, and *costata* of Burmeister, *C. Belti*, Bates, *C. associata*, Waterhouse, *Antichira pretiosa*, De Biême, and *A. crassa*, Ohaus. Of these the first has rightly been transferred to *Antichira*, being closely allied to *A. virens*, Drury, the typical species according to Dr. Ohaus's reconstitution of the genus. *Chlorota associata*, Waterh., is more closely related to *Antichira pretiosa*, De Br., than to any of the insects with which it has hitherto been grouped, and these two may conveniently be formed into a new genus, distinguished chiefly by the structure of the claws and the shape and size of the scutellum.

ÆQUATORIA, gen. nov.

Corpus subhemisphæricum. Clypeus productus. Scutellum magnum, elongatum, margine anteriore subtiliter convexum. Pronotum postice haud lobatum.

Femina tarsorum mediorum et posteriorum ungues simplices.

Mas incognitus.

Type: *Æquatoria* (*Chlorota*) *associata*, Waterh., Trans. Ent. Soc. Lond. 1881, p. 552.

Dr. Ohaus has already pointed out the chief characters of the group formed by *Belti*, Bates, *costata*, Burm., and *crassa*, Ohaus, but without proposing a common designation. These insects differ from *Antichira* in the form of the mandibles and the scutellum, and from *Chlorota* in addition by the long sternal process.

HYPASPIDIUS, gen. nov.

Corpus latum, subdepressum. Mandibulæ extus leviter sinuatæ, apice subacuminatæ. Prothoracis margo posticus rotundatolobatus. Scutellum magnum, subæquilaterale, lateribus non bisinuatis. Processus mesosternalis longus, curvatus, non clavatus. Ungues, ♂ pedum anteriorum interni divisi, ♀ pedum omnium unus divisus.

Type: *Hypaspidius (Chlorota) Belti*, Bates, Biol. Centr.-Amer., Col. vol. ii. (2) p. 270.

The remaining two insects, although at present catalogued as *Antichira*, exhibit no common point of difference from *Chlorota* except the striation of the elytra, which, however, occurs sexually in some of the species, and it seems better to retain them in the latter genus at the expense of superficial uniformity than to form new ones without adequate structural characters. The second of these insects, *C. metallica*, Burm., I believe to be the same as *C. viridana*, Har.

Chlorota flavicollis, Bates, is merely a pale variety, in which the dark centre of the prothorax has almost or entirely disappeared, of *C. cineticollis*, Blanch. The specimens are evidently imperfectly coloured, the elytra also being lighter than in normal individuals. The variety is not even local, for a Mexican specimen in the British Museum has the thorax entirely pale, and the specimens referred to *C. cineticollis* by Bates show considerable differences in the quantity of dark pigment present.

Dr. Ohaus's subdivision of *Antichira*, based upon his discovery of a stridulating apparatus, by virtue of which he relegates most of the species to the revived genus *Macraspis*, is an admirable one. He has not, however, fully described the structure which so sharply separates this genus from the rest of the Rutelidæ. The essential part of the apparatus, which Dr. Ohaus has not noticed, is a finely striated area similar to that found in all other stridulating Coleoptera, but in a position hitherto unknown. It consists of a ridge upon the inner face of the posterior femur near the knee and running parallel to the upper edge. Under a lens this ridge is seen to be transversely striated, forming a file which, by a movement of the leg against the body, is drawn across the oblique ridges upon the sides of the abdomen, producing the sound heard by Dr. Ohaus. These structures are invariably found together, and the presence of parallel oblique bars upon

the sides of an insect is therefore a sufficient indication of membership of the genus *Macraspis*.

The genus *Antichira*, as restricted by Dr. Ohaus to the species without this apparatus, contains only a small part of the old genus. In addition to the species enumerated by Dr. Ohaus ten others in the British Museum collection belong to *Antichira*, all of the remaining forms known to me, with the exception of those already dealt with, becoming members of the genus *Macraspis*. The ten are as follows :—

<i>A. bicolor</i> , Oliv.	<i>A. fulgida</i> , Waterh.
<i>A. teneata</i> , Perty.	<i>A. cuprina</i> , Lap.
<i>A. inaurata</i> , Burm.	<i>A. subaenea</i> , Burm.
<i>A. isthmica</i> , sp. n.	<i>A. Adamsi</i> , Waterh.
<i>A. calcarata</i> , Spm.	<i>A. substriata</i> , Waterh.

The insect assigned in the 'Biologia Centrali-Americana' to the South-American species *A. chlorophana*, Burm. (*A. corrusca*, Seiv., according to Dr. Ohaus), is an undescribed form differing from it in many sufficiently evident characters. It is larger and relatively broader, with a considerably larger scutellum, scarcely less than a third the length of the elytra at the suture, while that of Burmeister's insect is one-fourth only. The striation of the elytra in the latter is also much more distinct, and the form of the mesosternal process is conspicuously different, having a truncate club at its extremity in *A. chlorophana*, while in the Panama species it is of almost equal thickness throughout and rounded at the end. The diagnosis of the new species is as follows :—

Antichira isthmica, sp. n.

Ovata, subdepressa, roseo-lutea vel viridis, corpore subtus, pygidio pedibusque fusco-viridis plus minusve roseis; clypeo producto, crebre punctato, vertice, prothoraco scutelloque subtilissime punctatis, hoc apice infuscato; elytris irregulariter punctatis, vix striatis; pygidio grosse strigato; processu mesosternali elongato, curvato, nec clavato.

Long. 27 mm.

Hab. Nicaragua, Chontales; Panama, Chiriqui.

Another Central-American species, *Macraspis catomelena*, Dohrn, is a variety of *M. trifida*, Burm., an insect which, like the allied forms *M. cincta* and *M. variabilis*, is exceedingly variable in coloration.

Macraspis aterrima, Waterh., figures in Nonfried's Supplementary Catalogue of Rutelidæ, in the Berl. Ent. Zeit. 1892,

only as *aterrima*, Dej., which occurs as a synonym of *levi-collis*, Waterh., from which it differs as far as possible. Very near *M. aterrima* is *M. melanaria*, Blanch., which was included by Mr. Waterhouse, by mistake, in the synonymy of *M. tetradactyla*, L. It may be distinguished from *M. aterrima* by the sculpture of the pygidium, that of the latter having a smooth space upon the basal part, while in *M. melanaria* it is wholly striated.

It may be mentioned here that, among many other omissions and inaccuracies in the Catalogue referred to above, a number of species of this and allied genera described by Kirsch in the Berl. Ent. Zeit., 1870, have been entirely overlooked.

The following new species of the genus *Cnemida* is remarkable for its bright colouring in a genus of peculiarly sombre-coloured Rutelidæ, and it is also worthy of notice for the sexual difference in the colouring of the pygidium. It is the *Leucothyreus Leprieuri*, Buquet, of Dejean's collection, according to Reiche, but has of course no relationship with that genus. Specimens in the British Museum were collected on the Amazons by H. W. Bates.

Cnemida Leprieuri, sp. n.

Læte fulva, elytris exocetis metallico-nitens, capitis vertex, scutello prothoraceque viridibus, hujus lateribus fulvis, elytri margine laterali post medium nigro-maculato, macula ad apicem linea tenui producta; capite irregulariter crebre punctato, prothorace crebre punctato, disco sparsius, lateribus a medio antice valde convergentibus, postico leviter divergentibus; elytris regulariter punctato striatis; humeris fossulatis; pygidio undique striolato.

Long. 13 mm.

♂. Tarsorum anticorum ungue interno dilatato et diviso; pygidio viridi.

♀. Unguibus omnibus simplicibus; pygidio viridi, fulvo-marginato.

Hab. Amazons, Ega, Pará. •

Although generically the same as the described species of *Cnemida*, this will form a distinct section characterized by the evenly sculptured upper surface and the prothorax not narrowed behind.

The generic arrangement of the insects constituting Lacordaire's group of the Brachysternides requires amendment. For the insects at present known as *Aulacopalpus* a new genus must be made, the type of that genus, *Aulacopalpus viridis*, Guérin, being very different in structure. It is a glabrous insect, clothed beneath with long hairs and not

decumbent scales, and having the last joint of the maxillary palpus greatly enlarged and channelled along almost its entire length. Congeneric with this is a species doubtfully referred to *Tribostethes* by Philippi as *T. virens*, and said to be allied to "*Amblyterus variabilis*"; but what insect he spoke of by this name I am unable to discover. The common Chilean *Aulucopalpus viridis* of Burmeister is an insect of entirely different appearance, which may be distinguished by the name of *Hylamorpha*. Its chief generic characteristics are the dense clothing of scaly hairs upon the abdomen, the undivided claws, and the transverse clypeus. It has been characterized in detail by Burmeister. *H. viridis*, Burm., is the only species of this genus at present described, for *Aulucopalpus angustus*, Philippi, must be transferred to the genus *Brachysternus*, with which it agrees in all essential points, having only a superficial likeness to *H. elegans*.

The following are two new species of *Hylamorpha*:—

Hylamorpha rufimana, sp. n.

H. eleganti affinis, supra prasina, tota punctato-rugosa; abdomine nigro, albido-setoso, ore, antennis, pectore, pedibus anticis, aliorum tarsisque rufo-castaneis; tibiis posticis viridi-aureis; clypeo subquadrato, brunneo-marginato, margine parum reflexo; prothorace valde transverso, medio profunde sulcato.

Long. 15 mm.

Hab. Chili.

This insect is rather less elongated than *H. elegans*, Burm., the margin of the clypeus is less reflexed, and the anterior legs are without a trace of green.

Hylamorpha cylindrica, sp. n.

Olivacea; capite, prothorace, tibiisque anticis prasinis, prothoracis lateribus aureis, corpore subtus tarsisque castaneis, pectore fulvo-piloso; abdomine pilis albo-luteis oblecto; capite magno, clypei margine brunneo, reflexo; prothorace cum capite punctato-rugoso, lateribus regulariter arcuatis haud angulatis, margine postico vix lobato; clytris rugose punctato-striatis, crebre piliferis.

Long. 18 mm.

Hab. Chili.

H. cylindrica is rather less flattened above than the other two species. The elytra are not truncated behind and are somewhat densely clothed with setæ. The rounded sides of the thorax and the large head are also distinctive.

Solier's genus *Tribostethes* must also be renamed, being quite distinct from the true *Tribostethes* of Curtis. I propose to call this insect (*T. ciliatus*, Sol.) *Pseudadelphus*. Owing to the very inaccurate drawing of the figures in the 'Historia de Chile' the identity of this species has been in doubt, but if these are neglected the description is sufficient for its recognition, although, following the drawing, the claws are wrongly described as entire. Besides its divided claws it differs from *Tribostethes castaneus*, Curtis, by the thickly hairy anterior half of the pronotum, the antennæ of moderate length in the male, and the absence of a median process to the labium, in which it more closely approaches *Callichloris*.

To the latter genus belongs *Platycælia nigricauda*, Bates, as the extremely short mesosternal process and the form of the mouth-parts indicate. Bates's genus *Leucopelava* must also be placed in immediate proximity to *Callichloris*, if, indeed, it can be regarded as distinct. The author was apparently not acquainted with the latter genus.

I may remark here that Lacordaire appears to have been mistaken in his mention of the prosternum of *Callichloris*, "munie d'une saillie post coxale courte et comprimée." There is really nothing more than the usual slight tumidity behind the front coxæ.

In the genus *Platycælia*, *flavostrigata* of Burmeister must be distinguished from the true *flavostrigata*, Latr., of which a type specimen received by Dejean from Latreille is in the British Museum. There is good reason to believe that Latreille's description was drawn up from this specimen alone. It belongs to Burmeister's first section of the genus, in which there are no raised costæ upon the elytra. The false *P. flavostrigata* may be called *P. Burmeisteri*. The identity of the two species was queried by Blanchard in the 'Catalogue de la Collection Entomologique.'

The position of Solier's *Catoclastus Chevrolati* has long been a matter of doubt. Lacordaire was unable to assign a place to it on account of its so-called 9-jointed antennæ, while Philippi seems to have believed it to belong to the genus *Brachysternus*. A specimen of the insect is in the British Museum, labelled by Blanchard, with whom its name originated, and I am able to state that it should be placed in the genus *Pelidnota*, in the neighbourhood of *P. ignita*, Oliv. The antennæ are 10-jointed, but the seventh joint, as in the rest of the genus, is very short and in this species rather less apparent than usual.

Pelidnota prasina, Burm., must be regarded as a variety of

P. aruginosa, L. It is a form occurring in Colombia and Venezuela, and separated from the Brazilian *P. aruginosa* on a count of the absence of metallic lustre. This may be traced, however, in some specimens which cannot be distinguished from imperfectly developed Brazilian individuals, so that in the absence of other differentiating characters it cannot be regarded as specifically distinct.

One further correction of the 'Biologia Centrali-Americana' must be made. The Central-American insect there identified with the Colombian *Geniates spinolæ*, Burm., is a distinct species, as I have ascertained by comparison of original specimens of both in M. Oberthür's collection. A series of the Panama form has been received from Mr. Dolby Tylor, and it will avoid confusion to describe it here:—

Geniates panamensis, sp. n.

Breviter cylindricus, pallide testaceus, capito omnino pallido, prothoracis duabus maculis triangularibus et duobus punctis inconspicuis lateralibus vage fuscis, elytrorum marginibus interioribus tere usque ad humeros infuscatis; capite rugose punctato, clypeo subtruncato, lateribus parallelis; prothorace subtiliter punctato, angulis anticis acutis, posticis regulariter curvatis; scutello brevi, pentagonali; elytris pone humeros latitudine ad thoracis medii latitudinem aequalibus, undique subtilissime punctatis, et grossius lineato-punctatis, haud striatis; pygidio leviter punctato.

Long. 11 mm.

Hab. Panama, La Chorrera.

XLI.—*Descriptions of Two new Species of Shells from Japan.* By G. B. SOWERBY, F.L.S.

Buccinum striatissimum, sp. n.

Testa ovato-conica, crassa, albida, epidermide pallida tenuissime induta, spiraliter striata; spira elongato-conica, acutiuscula; anfractus circiter 8-9, valide convexi, rotundati, sutura impressa sejuncti, spiraliter densissime inciso-striati, striis eximie undulatis; anfractus ultimus supra tumidus, infra leviter contractus; apertura subovalis, alba, canali lato, brevissimo; columella antico rectiuscula, postice obliqua, in medio arcuata, callo crasso induta; labrum crassum, leviter reflexum, postice luvissimo sinuatum. Operculum typicum.

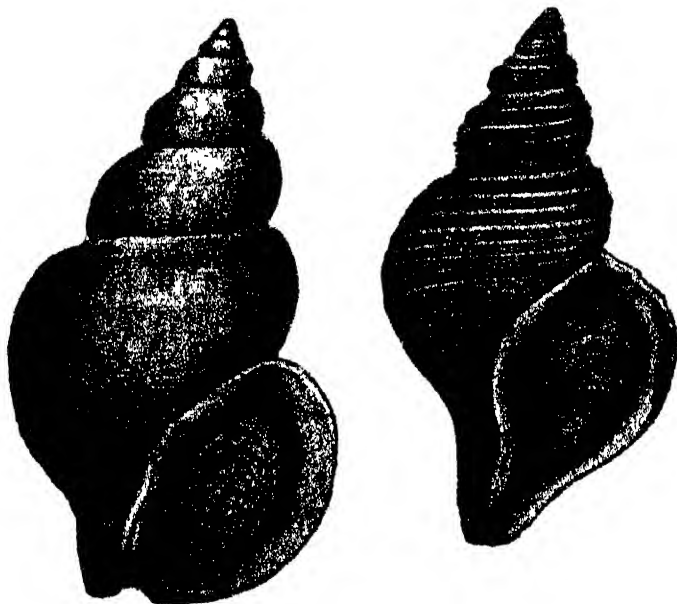
Long. 115, diam. 65; apertura longa 40, lata 26 mm.

Hab. Kunihamu, Tango, Japan.

This fine species is a typical *Buccinum*, but does not exhibit any of the longitudinal plicæ characteristic of *B. undatum*. The whorls are peculiarly rounded and swollen, while somewhat depressed at the suture. The whole surface of the shell is closely and regularly sculptured with fine waved grooves.

Fig. 1.

Fig. 2.

Fig. 1.—*Buccinum striatissimum*, Sow. ♂ nat. size.Fig. 2.—*Chrysodomus intersculptus*, Sow. ♂ nat. size

Chrysodomus intersculptus, sp. n.

Tosta lato-fusiformis, tenuis, utrinque acuminata, luteo-albida, careno-lirata; spira elongato-conica, gradata; anfractus 8, supra leviter concavi, deinde rotundo convexi, longitudinaliter tenuissimo et confortissime laminati, spiraliter lirati, liris elevatis angustiusculis, plerumque alternatim minoribus, interstitiis exiliter multiliratis; anfractus ultimus supra vix angulatus, in medio convexus, infra attenuatus, breviter rostratus; apertura luteo tineta, latiuscula, antice in canalem fere rectum breviter productum; labrum tenue; columella rectiuscula, callo tenui induta. Long. 116, diam. 58; apert. long. 63, lat. 26 mm.

Hab. Tango, Japan.

This species may be distinguished from *C. carinatus*, Pennant, by its more rounded, less angular whorls, longer and straighter columella, and yellow-tinged mouth. Between the spiral ridges appear numerous fine liræ, crossed by fine close-set laminae, from which character I propose the name.

XLII.—*On Butterflies collected between Chinde and Mandala, British Central Africa, by Edward M. de Jersey, Esq., in March and April, 1899.* By A. G. BUTLER, Ph.D., F.L.S., F.Z.S., &c.

THE collection of which this is an account is not a very large one, but contains some interesting forms of *Acraea*, three males of *Mylothris Rüppellii*, and several other species of less interest.

The following is a list of the species:—

Nymphalidæ.

1. *Limnas chrysippus*, Linn.

♂ ♂ ♀, Mandala, 11th April, 1899.

2. *Melanitis ismene*, Cram.

♂, between Chiromo and Katunga, 6th April, 1899.

“Did not seem to leave dark thick bush; had to be driven out.”

3. *Samanta perspicua*, Trimen.

♂ ♂, Mandala, 11th April, 1899.

Both specimens belong to the typical wet-season phase, but the irides of the ocelli are very narrow and smoky. Prof. Aurivillius still doubts, as I did at first, that *S. Simonsi* is the dry form of this species; but we have an intermediate example, received from Portuguese East Africa, and that, I think, should settle the question beyond all dispute.

4. *Neocænura ypthimoides*, Butler.

♂ ♂ ♀, Mandala, 10th and 11th April, 1899.

We recently had an example of *N. victoriae*, Auriv., given to us by the Rev. A. Dewar, who obtained it in company with *N. ypthimoides* on the Stevenson Road on the plateau between Tanganyika and Nyasa; it is quite distinct from *N. catensa*, having much more the outline of *N. Gregorii*.

5. *Precis sesamus*, Trimen.

(Wet form), Mandala, 11th April, 1899.

Prof. Aurivillius shows that *Precis* has priority over *Junonia*; therefore, although the latter is a far more satisfactory name for the genus (because more descriptive), I suppose it will have to go.

6. *Precis actia*, Distant.

Mandala, 11th April, 1899.

7. *Precis cuama*, Hewitt.

♀, Mandala, 11th April, 1899.

8. *Precis cebrence*, Trimen.

Near Blantyre, Mandala, 10th and 11th April, 1899

9. *Precis clelia*, Cramer.

♂♂♀, Chinde, 29th March; ♂♂, Mandala, 10th and 11th April, 1899

10. *Precis boopis*, Trimen.

♀, Chinde, 29th March, 1899.

11. *Precis artaxia*, Hewitt.

Much shattered; Mandala, 11th April, 1899.

12. *Precis natalica*, Felder.

♂, Mandala, 11th April, 1899.

13. *Hypolimnas misippus*, Linn.

♂♂♀♀, Chinde, 29th March; Mandala, 11th April, 1899.

14. *Hamanumida daedalus*, Fabr.

♀, Mandala, 10th April, 1899.

15. *Neptis agatha*, Cramer.

Mandala, 11th April, 1899.

16. *Byblia vulgaris*, Staud.

Mandala, 10th April, 1899.

17. *Atella columbina*, Cram.

Chinde, 29th March, 1899.

18. *Acræa cabira*, var. *apecula*, Oberth.

Mandala, 10th April, 1899.

There is not the slightest question as to this being a mere sport of *A. cabira*; we have a complete series of intergrades in the Museum collection.

19. *Acræa serena*, var. *Buxtoni*, Butl.

Chinde, 29th March; Mandala, 10th April, 1899.

20. *Acræa Doubledayi*, Guérin.

♂ ♀, between Katunga and Mandala, 8th April; ♂, Mandala, 10th April, 1899.

When I rearranged the Museum collection of Old-World *Acræinæ* I considered my *A. nero* to be a race of this species, the male received with my typical female from Victoria Nyanza being quite like that sex of *A. Doubledayi*, excepting that the internervular streaks, terminating in two spots, are wanting from the primaries of *A. nero*. Since that time we have received other males more richly coloured and with the apical black patch on the primaries varying immensely in width, one example showing a patch similar to that in *A. caldarena*. In his recently published important work entitled 'Rhopalocera Æthiopica,' my friend Prof. Chr. Aurivillius has sunk *A. nero* as an aberration of the female of *A. caldarena* (the male being evidently unknown to him); had he possessed males, and especially that form which most nearly approaches *A. caldarena*, he would have seen that the broken series of spots on the disk of the primaries is thrown much further back towards the base in *A. nero*, the two lower spots forming an inner series with the discocellular spot, whilst the three outer ones form a much more oblique series considerably more remote from the apical patch. *A. nero* is, in fact, a separate species, perhaps rather more nearly related to *A. caldarena* than to *A. Doubledayi*, but perfectly distinct from both.

21. *Acræa violarum*, var. *asema*, Hewits.

Mandala, 11th April, 1899.

22. *Acræa anacreon*, var. *bomba*, ab., Grose-Smith.

♀, Mandala, 11th April, 1899.

In this curious example the basal area of the primaries and nearly the whole surface of the secondaries are suffused with smoky purplish.

23. *Acræa natalica*, Boisd.

♂ ♂, between Chihomo and Katunga, 6th April; ♂ ♂ ♀, between Katunga and Mandala, 8th April; ♂ ♀, Mandala, 11th April.

24. *Pardopsis punctatissima*, Boisd.

Mandala, 11th April, 1899.

Lycænidae.

25. *Tingra amenaïda*, Hewits.

Mandala, 10th April, 1899.

As I hold that the true *Pentila* is identical with *Parapontia* (having *P. undularis* as its type), I retain the use of *Tingra* for the present genus. *T. amenaïda* is an extremely variable species, including, according to my judgment, *T. mombasæ*, *T. nero=bertha*, *T. Lasti*, and *T. Preussi=lunaris*; it varies enormously in one locality, and it varies locally. We possess all the above-named forms, none of which seem to me entitled to be regarded as distinct species. The variety *T. nyassana* is founded upon examples in which the spots on the under surface are small, but in some examples the spots are much larger on the under than on the upper surface. *T. Preussi* appears to me distinct from *T. petreia*, and to be merely an ochreous and little spotted variety of *T. amenaïda*. The ground-colour of the wings in this species varies quite as much as the width of the borders and the number or size of spots. Thus, from the Nyasa country we have primaries deep orange, secondaries smoky greyish brown; wings reddish orange, the primaries semitransparent and slightly greyish; all the wings deep ochreous, slightly suffused with grey; all the wings clear bright ochreous: to name and separate all such variations would be mere trifling, because it is hardly possible to get two examples that are quite alike.

26. *Teriomima Hildegarda*, Kirby.

Mandala, 10th and 11th April, 1899.

Both examples belong to the variety *T. freya*.

27. *Axiocerses harpax*, Fabr.

♂, Mandala, 11th April, 1899.

It is quite impossible to distinguish *A. harpax* and *A. perion* when a large series of examples is before one; nor do I believe it is possible to regard *A. mendeche* and *A. punicea* as more than aberrations, seeing how much the pattern of the upper surface, the colouring, and silver spotting of the under surface vary in a long series of *A. harpax*.

28. *Cupidopsis jobates*, Hopffer.

♀, on bank of Shire between Chiromo and Katunga, 6th April, 1899.

29. *Nacaduba sichela*, Wallgr.

♂, between Katunga and Mandala, 8th April, 1899.

30. *Lycænesthes adherbal*, Mab.

♂, Mandala, 10th April, 1899.

31. *Lycænesthes amarah*, Lefebvre.

♀, between Chiromo and Katunga, 6th April, 1899.

A much damaged specimen.

Papilionidæ.

32. *Mylothris Rüppellii*, Koch.

♂♂, between Katunga and Mandala, 8th April, 1899.

Hitherto this species, and especially the male, has reached us at such long intervals, and always singly, that it took me quite by surprise to receive three males in the same collection, all captured on the same day.

33. *Terias brigitta*, var. *zoe*, Hopffer.

♂♀, Chinde, 29th March, 1899.

The female is like the intermediate form (*T. candace*) on the upper surface, but is typical *T. zoe* on the under surface.

It is to be regretted that Prof. Aurivillius did not have an opportunity of seeing our magnificent collection of *Terias*

subsequent to its rearrangement and the incorporation of the Godman and Salvin and other important accessions; had he done so, it would have been surely impossible for him to have restored *T. Desjardinsii* (in his recent work) to its ancient state of chaos. *T. regularis* is a species found in Northern, E. Central, and Western Africa, but not occurring below Zanzibar to my knowledge; it is a wet-season form, without markings on the under surface, and the female has a well-defined border to the secondaries. *T. Marshalli* is a far more angular-winged insect, occurring rarely on the West Coast (we have only five western examples in a series of fifty-seven); it is the prevailing species in the south, and is not very common in the east; it is well marked on the under surface, and the female has a narrow dentated border with the spots often separate, always in the intermediate and dry forms. *T. Desjardinsii* is an island form having apparently only a dry phase*, the female (*T. aliena*) with a reddish apical flush above, but no dark marginal markings. *T. punctinotata*, the male of which is of a much brighter clearer yellow than any other species of the group, appears to be an intermediate-season form, inasmuch as it shows no rose-colouring on the under surface in either sex: it may, however, be a dry form of *T. regularis*, inasmuch as the outer border of the primaries in the male has a similar almost unbroken arch to its inner edge; if this be the case, it proves still more conclusively the entire specific distinctness of *T. regularis* from *T. Marshalli*, the markings on the under surface being very different and much sharper. The female, of course, is unlike that of any other form, for I do not believe that *T. mandarinulus* of Holland is a synonym of it.

34. *Terias senegalensis*, Boisd.

♀, between Chiromo and Katunga, 6th April; ♂ ♂ ♀, Mandala, 10th April, 1899.

The argument used by Prof. Aurivillius for the distinctness of *T. hapale* from *T. floricola* might, I think, lose its value if his specimen were soaked in strong spirit. I firmly believe that the male abdomen would then drop off, and an ordinary female would remain. Among the Godman and Salvin examples of *T. hapale* we received an exactly similar female, the abdomen of which is undoubtedly that of a male; the thorax has been rendered shiny and the base of the secondaries stained with weak shellac, proving conclusively that it

* Even Mabille appears to have known only the dry form, and figures it.

has been patched at some time. The *T. brigitta* group is so characteristically different in pattern from the *T. hecabe* group, that my explanation seems infinitely more probable than that a form having the pattern of *T. Boisduvaliana* ♀, but (unlike all other species of the genus) having both sexes coloured pale yellow, should suddenly appear in the midst of the *T. brigitta* group. I believe *T. hapale* to be distinct from *T. floricola*, but to be a very nearly related species.

35. *Catopsilia florella*, Fabi.

♂, S.S. 'Kaiser,' off Zanzibar Island, 20th March; between Katunga and Mandala, 8th April; ♂♂♀♀, Mandala, 10th and 11th April, 1899.

36. *Papilio demodocus*, Esper.

Chinde, 29th March, 1899; caught near the bank of the Zambesi.

Hesperiidæ.

37. *Purosmodus icteria*, Mabille.

Between Katunga and Mandala, 8th April; Mandala, 10th and 11th April, 1899.

38. *Baoris fatuellus*, Hopffer.

Mandala, 11th April, 1899.

39. *Rhopalocampta forestan*, Cramer.

Mandala, 11th April, 1899.

XLIII.—*Descriptions of new Rodents from the Orinoco and Ecuador.* By OLDFIELD THOMAS.

Rhipidomys marmosurus, sp. n.

Size medium. Fur close, rather less woolly and more *Oryzomys*-like than in typical *Rhipidomys*; the hairs about 8-9 millim. long on the back. General colour above rich reddish fulvous, finely lined with black. Head paler and greyer, no definite face-markings. Ears large, with but little anterior basal projection; their backs thinly haired, black, contrasting markedly with the general colour. Sides paler

fulvous, passing gradually, without sharp line of demarcation, into the colour of the belly, which is dull white, faintly washed with buff. Throat, chest, and groins clearer white, the hairs white to their bases. Arms and legs fulvous externally, whitish internally. Hands and feet fulvous above, gradually becoming browner terminally. Fifth hind toe without claw reaching to the end of the first phalanx of the fourth. Sole-pads broad, naked, obviously of the climbing type. Tail fairly long, its basal three quarters of an inch covered, as in most opossums, with longer fulvous fur similar in character to that on the body; the remainder shorter haired than in most *Rhipidomys*, finely scaled, uniformly blackish brown throughout.

Skull in general shape much as in typical *Rhipidomys*; back of nasals about level with ends of premaxillæ; supra-orbital ridges well developed, evenly diverging backwards as far as the middle of the parietals, then converging again to the corners of the interparietal; anteorbital plate of zygoma little developed; palatal foramina short, not reaching backwards to *m*.1.

Molars of the squarish shape typical of *Rhipidomys*, but smaller than usual in proportion to the size of the animal.

Dimensions of the type (an adult male, measured in the flesh by collector):—

Head and body 124 millim.; tail 157; hind foot (s. u.) 26; ear 18.

Skull: greatest length 34.2; basilar length 25.8; greatest breadth 17.5; nasals 11.4×3.5 ; interorbital breadth 5.8; interparietal 4.7×10 ; palate length from henselion 14.5; diastema 8.9; palatal foramina 5.2; length of upper molar series 5.2.

Hub. Maipures, Upper Orinoco.

Type B.M. no. 99. 9. 11. 38. Original number 11710. Collected Jan. 22, 1899, by Geo. K. and Stella M. Cherrie. One specimen only.

Although apparently best placed in *Rhipidomys*, this interesting rat shows considerable resemblance to *Oryzomys* by its coarser fur and less hairy tail.

Oryzomys auriventer, sp. n.

A large dark species with a rich fulvous underside.

Size rather less than in *Mus rattus*. Form delicate, the limbs long and slender. Fur straight and fine, not soft and woolly as in *O. aureus*; hairs of back about 10 millim. in length. General colour above dark blackish fulvous, the fulvous and black forming a coarsely lined mixture, especially

dark in the middle of the back; sides clearer but still dull fulvous. Under surface from chin to anus rich ochraceous fulvous, the hairs slaty grey basally; line of demarcation on sides fairly sharply defined. Head like body, the middle line blackish, the cheeks more fulvous. Ears rather large, dusky brown. Fifth hind toe reaching to the middle of the basal phalanx of the fourth; metapodials brown above, digits inconspicuously whitish; soles quite naked. Tail long and slender, practically naked, brown throughout except basally below, where it is slightly lighter; scales small, averaging about 13 to the centimetre.

Supraorbital edges sharply square, with slight ridges which run back to the middle of the parietals. Palatal foramina not reaching back to the molars.

Dimensions of the type (an old male, measured in the flesh by collector):—

Head and body 147 millim.; tail 160; hind foot (s. u.) 35; ear 23.

Skull (of a second, rather younger, male): greatest length 38; basilar length 29.2; greatest breadth 19.6; nasals 13×4.5 ; interorbital breadth 5.6; interparietal 4.3×10.5 ; palate length from hensenion 16.2; diastema 10; palatal foramina 5.6×2.5 ; length of upper molar series 6.3.

Hab. Mirador, below Baños, on the Upper Pastaza River, E. Ecuador. Altitude 1500 m.

Type B.M. no. 99. 9. 9. 25. Collected Feb. 8, 1899, by Mr. P. O. Simons. Original number 239. Two specimens obtained.

This fine species has a certain superficial resemblance to *O. aureus*, Tomes, but the characters of its feet and skull show it to be really more allied to some of the members of the *O. laticeps* or *O. gracilis* group, from all of which it may be readily distinguished by its peculiar coloration.

Zygodontomys stellæ, sp. n.

Similar to *Z. brevicauda* in general appearance, but much smaller, less rufous in colour, and with whiter feet.

Fur straight, hairs of back about 10 millim. in length. General colour above uniform grizzled fawn, the black and fawn about equally mixed; sides rather but not conspicuously paler. Under surface greyish, the hairs slaty basally, dull whitish terminally; no sharp line of demarcation on sides. Head like back, no darker markings round eyes. Ears of medium size, thinly haired, dull fawn or grey, no white spot on the head behind them. Arms and legs fawn-grey, upper

surface of hands and feet white. Tail about equal to the body without the head, thinly haired, brown above, well-defined white below.

Skull smooth and rounded, considerably bowed, its lateral profile evenly convex from nasal tip to occiput; supraorbital edges evenly divergent, the beading distinct, running in the usual way to the outer corners of the interparietal; palatal foramina extending to the anterior third of m^1 .

Dimensions of the type (an adult male, measured by the collector in the flesh):—

Head and body 110 millim.; tail 38; hind foot (s. u.) 20 6; ear 17·7.

Skull: greatest length 30; basilar length 23·5; greatest breadth 15; nasal length 11·6; interorbital breadth 5; interparietal $4·1 \times 9$; palate length from hensenion 12·5; diastema 8; palatal foramina $6·1 \times 2·5$; length of upper molar series 4·2.

Hab. Maipures, Upper Orinoco.

Type B.M. no. 99. 9. 11. 39. Original number 11522, collected by Geo. K. and Stella M. Cherrie.

This species is much smaller than the large *Z. brunneus*, Thos., and *brevicauda*, All., rather smaller, with differently shaped skull, broader nasals, and narrower choanæ than in *Z. microtinus*, Thos., and larger, with heavier feet and more clearly bicolor tail than *Hesperomys expulsus*, Lund, of which the British Museum possesses a topotype.

As I have used it before, I again provisionally use Dr. Allen's generic term *Zygodontomys* for this group; but Dr. Forsyth Major has drawn my attention to its close relationship to the typical *Hesperomys*, Waterh., as based on *H. bimaculatus*, and to the possibility that it should be amalgamated with that genus. As bearing on the question, the Orinoco species is of particular interest as being intermediate in size and character between the large "*Zygodontomys*" and the small "*Hesperomys*."

Echimys Cherriei, sp. n.

A small species, with the appearance of a young *E. trinitatis* or allied form.

Size small, form slender. Fur only spinous across the middle back and along a median line extending forwards to the withers; longest spines of this area about 19 millim. in length by 0·9 in breadth, horny white basally, gradually darkening to black terminally. General colour above coarsely grizzled rufous, very similar to that of *E. trinitatis* and its

allies; cheeks, sides of body, and hips clearer rufous. Under surface and inner side of limbs pure sharply defined white throughout. Upper surface of hands and feet white, browner along their outer edges. Tail about the length of the head and body, thinly haired, brown above and white below.

Skull (of a specimen with all the molars up and worn) almost exactly similar in size to that of a young *E. trinitatis* with only three molars erupted. Nasals slightly surpassing premaxillæ; supraorbital edges delicately ridged, the ridges disappearing almost immediately after passing the frontoparietal suture; pterygoids narrow, not broadened or spatulate terminally. Molars very small, of the usual structure.

Dimensions of the type (an adult female, measured by the collector in the flesh):—

Head and body 198 millim.; tail 198; hind foot (s. u.) 40; ear 24.

Skull: greatest length 49.5; basilar length 34.8; greatest breadth 23.8; nasals, length 17.5; interorbital breadth 10.4; palate length from henselion 17; diastema 10.5; palatal foramina 6×3 , length of upper molar series 7.7.

Hab. Munduapo, Upper Orinoco.

Type B.M. no. 99. 9. 11. 47. Original number 12126. Collected Feb. 27, 1899, by Geo. K. and Stella M. Cherrie. One specimen only.

Its small size will readily distinguish this *Echimys* from any of its allies. The type, as shown by its teeth, is fully adult, but is no larger than half-grown specimens of *E. trinitatis*.

Loncheres (Isothrix) bistriatus orinoci, subsp. n.

Similar in size and general characters to the typical form from the Rio Guaporé, but the bright yellow frontal line is dulled to grizzled grey, passing on each side, without sharp contrast, into the dark supraorbital lines. Behind each ear a prominent whitish patch, contrasting with the blackish nuchal part of the coalesced supraorbital lines. Other characters as described in subsp. *typicus*.

Dimensions of the type (an adult female, measured in the flesh by collector):—

Head and body 232 millim.; tail 273; hind foot (s. u.) 42.

Skull: greatest length 57; basilar length 43.4; greatest breadth 29.5; nasals 16.5×7 ; interorbital breadth 13.8; palate length from henselion 19.7; palatal foramina 5.1×3 ; length of upper molar series 11.5.

Hab. Maipures, Upper Orinoco.

Type B.M. no. 99. 9. 11. 45. Original number 11755.

Collected 26th January, 1899, by Geo. K. and Stella M. Cherrie. Five specimens examined.

I should have considered this fine animal as a distinct species from that of the Upper Madura were it not that Natterer's second specimen, from the Rio Negro, is, as I am kindly informed by Dr. Lorenz, more or less intermediate in character, as in locality, between the two.

XLIV.—*Note on the Beech-Marten and Badger of Crete.*

By G. E. H. BARRETT-HAMILTON.

DURING the recent troubles at Crete H.M.S. 'Fearless' has been frequently stationed at the island, and I am indebted to her paymaster, Mr. H. O. Jones, R.N., for the opportunity of examining several skins of mammals obtained there. Among these two beech-martens and a badger are of special interest.

The two skins of the beech-martens sent by Mr. Jones do not belong to the typical *Mustela foina*, Erxleb., of Europe, but are indistinguishable from *Mustela foina leucolachnæa*, Blanford, of which the British Museum possesses specimens from Hazara in Afghanistan and Vernou in Turkestan. The present locality therefore is a rather unexpected extension of the range of this subspecies.

The badger is very perceptibly lighter in coloration than those of Britain, but not so light as *Meles canescens*, Blanford, especially in the markings of the head. In this respect it agrees with two specimens from Seville, Spain, for which the British Museum is indebted to the late Lord Lilford, so that these Mediterranean badgers are interestingly intermediate between those of Persia and of Europe generally. I propose to regard this moderately light Mediterranean form as a subspecies under the name of *mediterraneus*, and to reduce Blanford's *Meles canescens* to subspecific rank. Of these two subspecies the following specimens are included in the British Museum collection:—

Meles meles canescens, Blanford*, Ann. & Mag. Nat. Hist. 1875, xvi. p. 310, No. 74. 11. 21. 1, Abadah, Persia, 1870; No. 97. 10. 3. 53, ♀ juv., W. T. Blanford, Tarte Koule, Ferghana, Persia, altitude 13,300 feet.

* "*M. affinis M. taxo*, sed minor, canescenti-griseo, haud fusco, dentibus posticis angustioribus. Hab. in Persia circum Isfahan &c."

Meles meles mediterraneus, subsp. n.—No. 95. 3. 3. 7, ♂, Seville, Spain, 15th Oct., 1894, and No. 95. 3. 3. 8, ♀, Seville, Spain, 16th Oct., 1894, the late Lord Lilford; No. 99. 6. 13. 1, ♀, Crete, 1899, H. O. Jones, R.N.—The type is No. 95. 3. 3. 7.

To the latter form probably belong the badgers of Asia Minor, since a specimen obtained at Zebil, in the Taurus, was stated by Messrs. Danford and Alston* to be nearly as pale-coloured as *M. canescens*, although in some other respects it resembled European examples. I have no skulls available for purposes of comparison, but the colour-differences are probably at least as reliable as those of the crania relied on by Mr. Blanford as characteristic of *M. canescens*.

There is another subspecies, *M. meles arenarius*, which I have not seen, described by K. Satunin from the Caucasus†, and of which the original description runs as follows:—“*Meles affinis M. turo*, sed minor, statura graciliore, capite albescente, utrimque vitta longitudinali per oculos (nec per aures) supra auresque ducta, ad nucham non latiore, cauda longiore, dente molare superiore angustiore.” It must be very nearly allied to *M. m. canescens* and *M. m. mediterraneus*.

In conclusion, it may be interesting to give a few dimensions (in millimetres) of some of the skulls of badgers in the British Museum collection. The skulls of males are usually larger and more massive, and have the sagittal crest much more strongly developed, than those of females.

M. m. mediterraneus.

	Total length (basion to gnathion).	Greatest breadth at zygoma.
♂, No. 95. 3. 3. 7. Seville, Spain (<i>the late Lord Lilford</i>)	122	81
♀, No. 95. 3. 3. 8 (<i>ditto</i>)	112	73

M. m. typicus.

♂ (no locality)	130	85
♂, England	118	84
♂, Co. Galway, Ireland (<i>R. F. Hibbert</i>). No. 95. 6. 2. 1	117	83
♀, Co. Galway, Ireland (<i>R. F. Hibbert</i>). No. 95. 12. 3. 1	117	83
♀, Sweden. No. 64. 3. 8. 1	117	71
♀, England	118	78
♀, England	112	76

* P. Z. S. 1877, p. 274.

† Archiv für Naturgeschichte, May 1895, p. 111.

XLV.—On a new Species of *Tamias* from Eastern Siberia.
By J. L. BONHOTE.

I HAVE recently received three specimens of a *Tamias* from Corea which, on comparison with specimens in the British Museum, I am unable to refer to either of the hitherto described species, namely *Tamias asiaticus* (Gm.) and *Tamias senescens*, Miller. They agree, however, with two other specimens from the River Ussuri in Eastern Siberia which were labelled *Tamias uthensis* (Pall.). Pallas's description does not apparently agree with the specimens, for, apart from other differences, he writes "Sub collo tractus longitudinalis albus, a labio inferiore ad sternum continuus; cæterum pars prona tota nigra," whereas in the specimens under consideration the whole of the underparts are pure white.

I propose to call this species

Tamias orientalis, sp. n.

Much brighter and ruddier in general coloration than either of the other species. There are five dark stripes on the back, the two outer ones being sometimes brownish, the remainder black, and alternating with these four stripes of a lighter colour. The subdorsal light stripes, as well as the whole of the hinder part, strongly suffused with ferruginous. There is a supraorbital stripe of white, which is clearly defined and continued forwards to the tip of the nose. The underparts are of a clear white.

The skull shows no marked differences; in length it is intermediate, but in breadth equal to the larger of the other species. The most noticeable point is the length of the nasals, which are longer and narrower than in *T. senescens*.

Dimensions of the type (from skin):—

Head and body 155 millim.; tail 115; ear 15; hind foot 35.

Skull: basal length 31; zygomatic breadth 22·5; length of nasals 13; post. breadth of nasals 4.

Hab. Eastern Siberia.

Type B.M. 94. 8. 6. 26. ♂ ad. Sungatscha River, Upper Ussuri River. Collected by Mr. J. Kalinowski, 16th April, 1884.

This species may easily be distinguished from *T. asiaticus* by the subdorsal light stripes being considerably ruddier and darker than the outer ones, whereas in *T. asiaticus* they are all of a similar colour. It may also be distinguished from

T. senescens by the supraorbital stripe being well defined and continued to the nose, its much brighter colour, and white underparts.

Key to the Species.

- | | |
|--|-----------------------|
| A. Five black stripes..... | <i>T. asiaticus.</i> |
| B. Three black stripes. | |
| Supraorbital line yellowish, not clearly defined | <i>T. senescens.</i> |
| Supraorbital line white, well marked | <i>T. orientalis.</i> |

XLVI.—*Contributions from the New Mexico Biological Station.*—VIII. *The New Mexico Bees of the Genus Bombus.* By T. D. A. COCKERELL and WILMATTE PORTER.

Bombus perixanthus, sp. n. (vel *Howardi*, var.).

♂.—Length about 15 millim.

Fairly stout; pubescence black, except at the apex of the abdomen, where it is white, and on the anterior part of the thorax, where it is shining lemon-yellow. With the black, however, is mixed more or less yellow on the face, vertex, and third abdominal segment; while the hair on the scutellum varies from entirely black to a rather dull yellow. The long bristles on the hind tibia are mostly pale ferruginous. The black hair on the abdomen occupies the first four segments, the remaining segments being clothed with dirty white. Wings stained with brown, but not very dark.

Structurally this insect agrees with *B. Howardi*, and it may be that it is a peculiar variety of that species; but even in that case it deserves a name. It is in general appearance very like *B. occidentalis*, but in that species only the first three abdominal segments are black.

Hab. Harvey's Ranch, near Las Vegas, New Mexico, 9600 feet, Aug. 22, 1899 (*W. Porter*). Also between Harvey's Ranch and Beulah, on the same day.

Bombus iridis, sp. n.

♀.—Length 17 millim.

Broad, with black and yellow hair. Hair of face black, with a little yellow intermixed, of cheeks black, of vertex black in front, otherwise yellow. First joint of flagellum nearly as long as 2 and 3 together, 2 scarcely shorter than 3. Thorax with dense lemon-yellow pubescence; a broad black

band between the wings; hair on anterior half of pleura yellow, on posterior half black. Hair of the legs black, the ends of the joints with short pallid pubescence, small joints of tarsi with shining brown pubescence. Wings only moderately dark, the costal margin narrowly suffused with fuscous, especially towards the apex. First three segments of abdomen with black hairs, but *the black is throughout mixed with coppery red*, or on the sides of the first segment wholly or almost wholly pale fulvous or fawn; fourth segment and sides of fifth with yellow hair, quite long, forming a band; apex black. Ventral surface of abdomen with scanty black hair.

Hab. Beulah, New Mexico, May 30, 1899, at flowers of *Iris missouriensis* (W. Porter).

Allied to *B. dubius*, Cresson, but in that species the light hair on the fourth abdominal segment is yellowish white and the basal portion of the abdomen has not the reddish hairs. Another specimen of *B. iridis*, taken at Monument Rock, Santa Fé Cañon, 8000 feet, at *Rudbeckia laciniata*, Aug. 11 (Ckll. 4425), has the hair on the sides of the first abdominal segment and somewhat on the second yellow or tawny, while the third segment has a yellowish-fulvous apical band.

Bombus fervidus, Fabr., 1798.

Las Vegas, N. M., July, ♀ (Ckll. 3705); Las Vegas, at flowers of *Petalostemon candidus*, Aug. 11, ♀ (W. Porter). White Mts., N. M., Rio Ruidoso, about 6700 feet, at flowers of *Vicia* near *pulchella*, July 29, 1 ♂ (Townsend). Apparently scarce in New Mexico.

Bombus monardæ, sp. n.

Resembles *fervidus*, but the yellow is not so bright, the third submarginal cell is more narrowed above, and the hair of the face and vertex is yellow, with some black on the sides of the vertex and on the front. The pubescence is rather longer and looser than in *fervidus*, *borealis*, or *sonorus*; the hair on the pleura is yellow, not black as in *borealis* and *sonorus*; the wings are only stained with brown, not dark brown as in *sonorus*.

Hab. Monument Rock, Santa Fé Cañon, N. M., 8000 feet, at flowers of *Monarda* (Ckll. 4445); Rio Ruidoso, White Mts., N. M., 6500-6600 feet, July 25 to Aug. 1. Six at flowers of *Monarda stricta*, one at *Potentilla Thurberi*, one at *Allium cernuum* (U. H. T. Townsend).

Bombus sonorus, Say, 1837.

Prof. C. H. T. Townsend brought twenty-eight specimens from the Rio Ruidoso, White Mts., N. M., taken from July 20 to Aug. 2, alt. 6500 to 6900 feet, at flowers of *Monarda stricta* (many), *Verbascum thapsus* (many), *Vicia* near *pulchella*, *Prunella vulgaris*, *Mentzelia Rusbyi*, and *Rhus glabra*. Mr. C. M. Barber collected the species in the same locality. One specimen (Ckll. 4672) has been taken at Las Cruces, Aug. 24, at flowers of *Helianthus annuus*.

Handlirsch is certainly in error in regarding this species as a variety of *B. pennsylvanicus*. It is interesting to note that *B. sonorus* appears to be absent from the mountains of northern New Mexico, while, on the other hand, *B. Howardi* seems to be lacking in the White Mts.

Bombus americanorum, Fabr., 1775.

Common in the Mesilla Valley, June, July, October, &c. One at Las Vegas, July 14, at flowers of *Cleome serrulata* (E. K. Rishel).

Bombus Morrisoni, Cresson, 1878.

Common at Santa Fé, Las Vegas, &c., in July and August. At Las Vegas it was taken on the flowers of *Cleome serrulata*, also on *Asclepias*. Romeroville, Aug. 6 (Porter & Ckll.); Aztec (C. E. Mead); Ruidoso Creek, 6900–8200 feet, July 23–Aug. 20, at flowers of *Monarda stricta* and *Solidago trinervata* (Townsend); South Fork, Eagle Creek, Aug. 19, 8300 feet, at *Sicyos parviflorus*; Las Cruces (S. Steel, Ckll.); Mesilla Park, May (J. D. Tinsley); Albuquerque (Ckll.); Shipping Spring, Organ Mts., April 23 (Ckll.); Mescalero Agency, Aug. 22, 1897, at *Salvia lanceolata* (E. O. Wootton).

The vertical range is from 3800 to 8200 feet, but the insect seems to be most abundant at 6500–7500 feet.

Bombus nevadensis, Cresson, 1874.

This species may be divided into two well-marked races, perhaps species, as follows:—

Race *Cressoni*, Ckll.

♀.—Abdomen with only the first three segments yellow, segment 1 often black at base; black thoracic patch usually visible without a lens; pleura with only a small patch of yellow, just below tegulæ.

Length about 23 millim.

Specimens from Washington State and Colorado, sent by Mr. Fox as *nevadensis*. In New Mexico, especially at high altitudes. White Mts., at about 10,300 feet, at flowers of *Delphinium scopulorum*, several (*Townsend*); South Fork, Eagle Creek, Aug. 19, about 8300 feet, at flowers of *Scyos parviflorus*, two (*Townsend*); North Fork, Ruidoso Creek, Aug. 20, alt. 8200 feet, at flowers of *Solidago trinervata*, two (*Townsend*); Mescaleño Agency (*Otis*); Las Vegas, July, two, one at *Cleome serrulata* (*Porter & Ckll.*).

Race *aztecus*, Ckll.

♀.—Abdomen with the first four segments yellow, segment 1 yellow at base; black hairs in middle of thorax not visible without a lens; pleura with the anterior half at least yellow.

Usually at lower altitudes than *Cressoni*.

Length about 20 millim.

Aztec, one (*C. E. Mead*); Las Vegas, one (*W. Porter*); Beulah, May 30, at *Verbena bipinnatifida*, one (*W. Porter*); Mescaleño Agency, July 12, one (*C. M. Barber*); half a mile below forks of Ruidoso Creek, Aug. 28, one (*Barber*); Rio Ruidoso, July 23–27, 6700–6900 feet, three at flowers of *Monarda stricta*, one at *Lupinus Sitgreavesii*, one at *Verbascum thapsus* (*C. H. T. Townsend*).

Bombus improbus, Cresson, 1878.

Five (♂) from South Fork, Eagle Creek, White Mts., N. M., Aug. 20, about 8200 feet, flying swiftly to and fro (*Townsend*). This is with little doubt the male of *nevadensis*. One specimen was taken by Prof. Townsend on flowers of *Senecio Rusbyi*.

Bombus Howardi, Cresson, 1863.

Beulah, May 30, Aug. 16 (*W. Porter*); Harvey's Ranch, 9600 feet, Aug. 22, 1899 (*W. Porter*); Monument Rock, Santa Fé Cañon, at *Monarda* and *Liudbeckia* (*Ckll.*). Rather common.

Bombus appositus, Cresson, 1878.

Beulah, Aug. 16, at *Polemonium caeruleum* (*W. Porter*); Harvey's Ranch, 9600 feet, Aug. 22 (*Porter & Ckll.*); Monument Rock, Sta. Fé Cañon, at *Monarda* (*Ckll.*); North Fork, Ruidoso Creek, 8200 feet, Aug. 12, at *Delphinium scopulorum* (*Townsend*). The species is rather common at Beulah,

but in the large collection of *Bombus* brought by Prof. Townsend from the White Mts. it is represented by only a single specimen.

Bombus rufocinctus, Cresson, 1863.

Beulah, Aug. 25, ♂ (*W. Porter*); hill near Beulah, Aug. 23, ♂ (*W. Porter*). These are assigned to *rufocinctus*, but some black hairs are mixed with the yellow on the apical portion of the abdomen, though they are not noticed without a lens.

Bombus ternarius, Say, 1838.

Rio Ruidoso, 6700–8200 feet, July 29–Aug. 12, at flowers of *Rudbeckia laciniata*, *Verbascum thapsus*, *Mentzelia Rusbyi*, *Monarda stricta*, *Vicia* near *pulchella*, and *Solidago trinervata* (*Townsend*); Beulah, May 30, at *Iris missouriensis* and wild plum (*W. Porter*); Beulah, Aug. 10–18 (*W. Porter*); Harvey's Ranch, 9600 feet, Aug. 22 (*W. Porter*); Aztec (*C. E. Mead*); Mescalero (*Otis*). This species is not so abundant as *B. justus*.

Bombus justus, Cresson, 1878.

Beulah, May 30, at *Iris missouriensis* and wild plum (*W. Porter*); Beulah, Aug. 16–23 (*W. Porter*); Harvey's Ranch, 9600 feet, Aug. 22 (*Porter & Ckll*); South Fork, Eagle Creek, White Mts., 8000–8900 feet, Aug. 18–19, at *Sicyos parviflorus* and *Brittonastrum pallidum* (*Townsend*); Rio Ruidoso, 6500–8000 feet, July and August, at *Verbascum thapsus*, *Prunella vulgaris*, *Vicia* near *pulchella*, *Monarda stricta*, *Mentzelia Rusbyi*, *Solidago trinervata*, and *Verbena stricta* (*Townsend*); South Fork, Eagle Creek, Aug. 18, at *Allium cernuum* (*Townsend*); Ruidoso Creek, Aug., at *Geranium Richardsoni* (*E. O. Wooton*); East of Santa Fé, 7400 feet, at *Senecio* (*Ckll.*); Sta. Fé Cañon, 7600 feet, at *Cnicus* (*Ckll.*); Monument Rock, Sta. Fé Cañon, at *Monarda* and *Rudbeckia* (*Ckll.*). A very abundant species at 8000–9000 feet.

Bombus scutellaris, Cresson, 1863, var.

♀.—Length about 16 millim., of anterior wing 14 millim.

Pubescence of head black, of thorax yellow with a very broad black band between the wings, and the lower part of pleura and sides of metathorax black; pubescence of legs short and black, of abdomen yellow on the first two dorsal segments, black on the rest; tegulæ shining black; wings dark fuliginous; third submarginal cell very broad above,

narrowed much less than half to marginal. Spurs dark ferruginous. Malar space about twice as broad as long. The pleura may be all yellow. Abdomen rather long and narrow.

Hab. Las Vegas, N. M., Aug. 11, 1899, at flowers of *Petalostemon candidus*, two examples (*W. Porter*).

This is apparently a slight variety of *B. scutellaris*, Cresson. *B. affinis*, Cress., from Massachusetts, is also a very similar insect, but differs by having the second abdominal segment mostly pale seal-brown or rufo-fulvous.

Bombus prunellæ, Ckll., sp. n. (vel *Edwardsi*, subsp.).

♀.—Length about 18 millim.; broad, $6\frac{1}{2}$ millim. between wings; breadth of abdomen 9 millim.; length of anterior wing 15 millim.

Pubescence moderately loose and long, black and pale canary-yellow; clypeus shining, very sparsely punctured; lower sides of face, surrounding clypeus, with black hair; middle of face about antennæ with yellow hair; occiput with yellow hair, bordered in front with black; a patch of yellow in the middle of the vertex above the ocelli; cheeks with black hair; thorax with yellow hair above and beneath, except a large transversely oval patch between the wings, where it is black; legs with black hair, more or less light fulvous on the tarsi; abdomen with yellow hair on segments 1 and 2, black on 3 except at extreme sides, yellow on 4 and 5, and black at apex; wings dusky, third submarginal cell narrowed about one half to marginal.

♂.—Length about 12 millim.

Coloured like the female, but the yellow is not so bright and the black is more suffused, and the third and fourth abdominal segments are black. The pubescence of the head is long and almost all black, and there are black hairs all over the mesothorax and scutellum, mixing with the yellow towards the sides. First joint of labial palpus $3250\ \mu$, second $1000\ \mu$.

♀, var.—The black invading the sides of the second abdominal segment. (Beulah.)

♀, var.—The black covering the fourth segment as well as the third. (Rio Ruidoso.)

Hab. Beulah, N. M., 1 ♀, May 30, 2 ♂, Aug. 18 (*W. Porter*); Rio Ruidoso, White Mts., N. M., 6500–8200 feet, July and August, 4 ♀, 60 ♂, at flowers of *Monarda stricta*, *Verbena stricta*, *Solidago trinervata*, *Prunella vulgaris*, *Potentilla Thurberi*, *Rhus glabra*, *Sicyos parviflorus*, *Geranium atropurpureum*, *Vicia* near *pulchella*, *Commelina dianthifolia*, and

Mentzelia Rushyi (C. H. T. Townsend). Many workers were taken on the *Prunella*. Those from the *Mentzelia* are laden with pollen. This species (♀) was also taken by Mr. C. M. Barber on the Rio Ruidoso, Aug. 28, and by Mr. Otis at the Mescalero Agency.

This is very close to *B. Edwardsii*, Cresson, but differs in the ♀ having the first two abdominal segments yellow. The ♀ var. from Benlah connects the typical *prunellæ* ♀ with *Edwardsii*, and it may be that the insects will be found to intergrade. *B. Putnami*, Cress., seems also allied.

The following table will serve for the separation of the New-Mexico *Bombi*:—

- | | | |
|--|----|------------------------------------|
| Abdomen with a distinct reddish-orange or orange-fulvous band | 1. | |
| Abdomen without any distinct orange or red band | 3. | |
| 1. Abdomen without black, or with only a few black hairs among the yellow; red band on segment 3 or 3 and 4 | | <i>rufoinctus</i> , Cress. |
| Apex of abdomen black | 2. | |
| 2. Red band very bright, on segments 2 and 3; 4 yellow | | <i>ternarius</i> , Say. |
| Red band not so bright, on segments 3 and 4 | | <i>juxtus</i> , Cress. |
| 3. Dorsum of thorax yellow, without a band; apex of abdomen black or (<i>improbus</i>) black and ferruginous | 4. | |
| Dorsum of thorax yellow in front, black behind | 6. | |
| Dorsum of thorax with a black band between the wings; scutellar region yellow | 7. | |
| 4. Dorsum of thorax entirely yellow; lower edge of yellow on abdomen (♀) convex | | <i>Morrisoni</i> , Cress. |
| Dorsum of thorax with some black hairs centrally; hind edge of yellow on abdomen straight | 5. | |
| 5. Apex of abdomen all black | | <i>nevadensis</i> , Cress. |
| Apex of abdomen ferruginous; subapical part black | | <i>improbus</i> , Cress., ♂. |
| 6. Base and apex of abdomen black; segments 2 and 3 and apex of 1 yellow | | <i>americanorum</i> , Fabr., ♀. |
| Base of abdomen black, apex white; segment 3 yellow, 4 black | | <i>Howardi</i> , Cress., var. |
| Abdomen black, with a yellowish-white apex; no yellow band | | <i>perixanthus</i> , Ckll. & Port. |
| 7. Thorax before the band white; abdomen yellow, with no black band | | <i>appositus</i> , Cress. |
| Thorax before the band yellow | 8. | |
| 8. Abdomen yellow, with a black apex | 9. | |
| Abdomen entirely yellow or ochreous | | <i>americanorum</i> , Fabr., ♂. |
| Abdomen black, with a whitish apex | | <i>perixanthus</i> , Ckll. & Port. |
| Abdomen black, with a white apex and a yellow band | | [ter, var. <i>Howardi</i> , Cress. |

- Abdomen yellow, with a broad black band . . . *prunella*, Ckll.
 Abdomen black, with a yellow band on segment 4; segment 1 more or less yellow or fulvous; 2 and 3 black, with coppery hairs intermixed *iridis*, Ckll. & Porter.
 9. Abdomen with the two basal segments yellow, the rest black *scutellaris*, Cress.
 Abdomen with at least three segments yellow. 10.
 10. Yellow very bright; wings very dark; pleura black *sonorus*, Say.
 Yellow not so bright, more ochreous; wings not so dark; pleura mostly or wholly light. 11.
 11. Hair of face and vertex yellow *monarda*, Ckll. & Porter.
 Hair of face and vertex black *fervidus*, Fabr.

It is intended in a later paper to give an account of the mouth-parts of the several species, after the manner of Radoszkowski.

Mesilla Park, New Mexico, U.S.A.,
 Sept. 30, 1899.

BIBLIOGRAPHICAL NOTICE.

The Geography of Mammals. By W. L. SCLATER, M.A., F.Z.S., and P. L. SCLATER, M.A., Ph.D., F.R.S. London: Kegan Paul, Trench, Trübner, & Co., Ltd. 1899.

THIS book of 328 pp., with 50 text-illustrations, tables, and 8 folding maps, fills a gap in our series of zoological works of reference. It is divided into three parts or sections:—a first (of seven chapters) on the Terrestrial Areas as determined by Mammalian Distribution; a second (of one chapter) on the Marine Regions in relation to the Cetacea and Sirenia; and a third (like the first, of seven chapters) on the Distribution of the several Orders of Mammals. Of these sections, the first is a reprint, with slight alterations, of some articles contributed during 1894–1897 by Sclater Fils to the ‘Geographical Journal,’ the second a reprint of a paper by Sclater Père in the Zoological Society’s ‘Proceedings’ for 1897, the third (for which the latter also is alone responsible) constituting the original portion of the work.

The maps are coloured and most admirable, and it is difficult to over-estimate the value of the illustrations, many of which are new and highly welcome. Following Huxley, the authors recognize as their three leading areas the Arctogæa, Neogæa, and Notogæa, and in their determination of subregions and description of representative faunas they have succeeded in maintaining a uniformity of treatment and general accuracy which is in itself a strong recommendation

of their book. Concerning the origin of the geographical regions, they have mainly adopted the views of the senior author, originally based, as all students of chorology are aware, on the study of the avifauna, and this, it seems to us, with an insufficient recognition of some of the more special features in mammalian distribution. Dealing with the difficult question of the delimitation of the Australian from the Oriental Region, they, with full justification, relegate the Celebes to the latter, drawing their Wallace's line between Bali and Lombok. The reader turns with disappointment from their comprehensive treatment of this vexed topic to that of others, which he finds dismissed in far too summary and one-sided a manner, as, for example, the origin of the Galapagos Islands, the argument for the continental nature of which is not discussed. Nor is the book free of contradiction in its leading theses, as with the assertion (p. 217) that "the principal masses of land and water are not of modern origin, but have existed mainly in their present shapes throughout all ages," which is not consistent with statements occurring in other parts of the book. Greater regard for palæontology would have necessitated profound modification in many of the conclusions to which the authors have arrived, and we can only regret that important facts of which this may be said to be true have been unrecognized.

The authors wisely introduce here and there facts of anatomy and physiology which are strikingly exceptional—to wit, the allusion to the shedding of the horn by the prongbuck. If this, however, why not a mention of the narial prolongations, habits, and alleged vegetable contents of the stomach of the Delphinid *Sotalia Tenzu*? the existence of which genus in African rivers, by-the-bye, is entirely overlooked. We are glad to note the allusion to *Romerolagus* and certain other recently described forms of importance, and hail with satisfaction the non-acceptance of the proposal to substitute *Procavia* for *Hyrax*, *Odobenus* for *Trichechus*. We would remark, however, that *Otocyon* is not a dog, and that throughout the book there is a lack of uniformity in the usage of family and generic names and, in places, of agreement as to leading assertions. This is the more remarkable since the articles which so largely compose the work, having been subjected to "slight alterations," ought to have been correlated, and since the authors acknowledge the services of two assistants who are supposed to have read the proofs.

The imprimatur of the senior author will alone ensure the popularity of the work. It contains a mass of really useful material compiled at immense pains; and if the authors will give us a new edition, thoroughly revised in its typographical detail and choice of names, more extensively palæontological, better up to date, and less biassed in the treatment of its broader topics and chief generalizations, they will perform a lasting service to the student of animal life.

MISCELLANEOUS.

On the Histology of the Alimentary Canal in the Larva of Chironomus plumosus. By P. VIGNON.

I. *Criticism on the Vesicular Theory of the Secretion of Glandular Merocrine Cells.*—I thus characterize the theory held with regard to renal cells by a long list of authors, from Muron in 1871 down to Simon in 1898 (also by Cornil in 1879 and 1884, Altmann, Nicolas, Van der Stricht, Disse, &c.), and criticized by Hortolés in 1881 and by Sauer in 1895. This theory was applied by Van Gehuchten in 1890 to the intestine of a dipterous larva, *Psychoptera*; then in 1893 to the intestine of the larva of the fly, of *Ascaris*, and of *Arenicola*, &c. It is accepted by most authorities, and I know of no criticism of it so far as it relates to intestinal cells*.

The tissues of the larva of *Chironomus* being quite transparent, observations made upon the fry, and even on the complete animal when very young, point to the following conclusions:—the hyaline vesicles which support the brush-like edge (or striated platform—"plateau") seen on the greater part of the cells of the mid-gut, and which afterwards show it up and spread into the cæca or the chylic stomach, as well as into the Malpighian tubules, without anywhere being dissolved, are the result of a pathological state or of some very light pressure, or, again, of the action of a fluid said to be *indifferent*, and with more likelihood of fixative solutions.

Not a single one is ever seen in the living and uninjured animal even when digestion is in full swing. One has no right to draw conclusions from these plasmolytic changes as to the secretory properties of the epithelial cell; they are simply a proof of the great ease with which it may undergo alteration.

I shall endeavour to ascertain eventually whether these conclusions apply to all the glandular merocrine cells.

II. *Formation of the Peritrophic Membrane.*—This chitinous membrane, imperforate but at the same time extremely permeable, has no connexion with the walls of the chylic stomach, at least in the present case. This is in direct opposition to the somewhat indecisive opinion of Plateau in 1876, of Balbiani in 1890, and to the plainer statement of Voinov in 1898. The last observer believes it to be formed of all the cell-plates supported by the secretive vesicles. Although it may be firmly fixed to the external wall of the œsophageal tube, as has been observed by A. Schneider in 1887, followed by Balbiani in 1890 (in both cases in the larva of *Chironomus*), it is not formed in that position. It arises in a fluid state

* I may refer to the statement which I made in vol. iii. of the 'Année biologique' in the course of a review entitled "Les Canalicules urinaires des Vertébrés"

from the first large cells with brush-like edge belonging to the mid-gut right at the top of the proventricular chamber. This agrees with Cuénôt's opinion in 1895 with regard to several Orthoptera. Furthermore, while spreading over the cuticle of the external wall of the tube, in intimate connexion with the latter, it passes into a very elegant lamina, which has not been described. It is also through the annular space enclosed between the tube, whose wall is thickened to form a solid ring, and a second chitinous external ring secreted by the wall of the mid-gut that the secretion-products of the proventricular cæca flow (well figured diagrammatically by A. Schneider). The arrangement is complicated by a little truncately conical ring arising from the wall of the tube, and which separates the internal chitinous ring from the external plastic chitin of the membrane. The whole structure is shown up in sections by the differences of power of taking the stain displayed by the cuticle of the tube and rings and that of the still plastic peritrophic chitin. Below this passage the membrane becomes consistent and very thin. It is continually induced to go forward by the pressure of the food driven out of the œsophagus by the action of the circular muscles.

III. *Existence of Vibratile Cilia in the Mid- and Hind-Gut of the Larva of Chironomus.*—It is necessary to examine a number of animals in order to find and fix these in a perfect state. Examination would be impossible in the absence of transparent tissues. The cilia are found at the opening of the proventricular cæca in the three regions into which the chylific stomach is divided—in the first two on the brush-like edge, in the third (where the Malpighian tubules open) on the cellular wall, devoid of platform (plateau). It is very interesting to determine that the platform is never wanting in the first two regions, when one cannot see the cilia, but when these exist they may be planted directly on the cell. This simplification, here accidental, is comparable with the observations of Engelmann in 1880 and of Frenzel in 1886, who look upon the component parts of the brush as an immobile proximal segment forming an integral portion of the whole and completely differentiated ciliary apparatus. As there exists in the animal kingdom an infinity of non-ciliated cells with a platform, the larva of *Chironomus* takes an intermediate position in which the platform is probably only ciliated in a certain number of individual cases.

Cilia also are present in the hind-gut on the chitin, which is very thin. They are only found sparingly at the beginning, and particularly so in the widened part, where it joins the mid-gut.

I shall give more details of the anatomy and histology of the alimentary canal in this larva in a note which I shall publish shortly in the 'Archives de Zoologie expérimentale.'—*Comptes Rendus*, t. cxxviii. (1899) pp. 1596-1598.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 24. DECEMBER 1899.

XLVII.—*On some Land-Mollusks from Java, with Description of a new Species.* By WALTER E. COLLINGE, F.Z.S.,
Mason University College, Birmingham.

[Plates VII. & VIII.]

THE species here described form part of a collection of mollusks which has been placed in my hands for investigation by the Council of the Birmingham Natural History and Philosophical Society, and I take this opportunity of expressing my thanks to them for so interesting a collection and for their further kindness in defraying the cost of the drawings.

The collection includes two well-known and one doubtful species of *Parmarion* and two species of *Microparmarion*, one of which is new.

PARMARION.

1. *Parmarion pupillaris*, Humb. (Pl. VII. figs. 1, 2.)

Hab. Geda.

The anatomy of this species has been treated of by Semper (2) and Simroth (3). In the present collection there are a large series of specimens, many of which I have dissected.

The generative organs are well figured by Simroth (3), and those dissected by me agree in all particulars; in two cases, however, an interesting and important variation was found in the form of the receptaculum seminis. In the

normal condition this organ has a well-defined receptacular duct and a globular head. In the first specimen (Pl. VII. fig. 1) there is no duct, the head being somewhat beak-shaped, with a long neck surmounted on a globose base, a slight constriction separating the basal portion from the neck portion. In this specimen the penis is rather longer than in the other specimens dissected (Pl. VII. fig. 1, *p.*). In the second specimen (Pl. VII. fig. 2) there is also no trace of any receptacular duct, the receptaculum seminis being somewhat pyriform in shape. A further variation in these two specimens is to be seen in the length of the retractor muscle of the penis. In the first one it measures 6·5 millim., while in the second it is 30·5 millim.

2. *Parmarion Weberi*, Simr.

Hab. Geda. Three specimens.

I have experienced great difficulty with this species; it seems to be the most variable of any of the Malayan *Parmarions*. All the specimens are full-grown, measuring (in alcohol) 48·5, 50, and 52 millim. respectively. In one specimen the mantle-lobes and head are a deep sepia-brown, while the sides of the body are a yellowish green. The foot-sole has a yellowish median plane, with faintly coloured sepia lateral planes. The remaining two specimens have reddish-brown coloured mantle-lobes, with the head and sides of the body a pale yellowish green, approaching the form figured by Simroth (3, t. vii. fig. 6 *b*). None of my specimens are so darkly coloured on the sides of the body as that shown in figure 6 *a* (*op. cit.*) by Simroth.

3. *Parmarion* —?

Hab. Surabaja. One specimen.

A small species measuring (in alcohol) 24 millim. is exactly like Simroth's drawing of *P. cambodjensis* (4, t. xv. fig. 10); but Simroth says that *P. cambodjensis* approaches most closely to *P. Martensi*, so mine cannot be this former species, as the mantle is perfectly smooth, there being no trace of any wart-like markings. Having only a single specimen, it is difficult to say what it is.

MICROPARMARION, Simr.

4. *Microparmarion Austeni*, Simr. (Pl. VII. figs. 3-10.)

Hab. Geda. Three specimens.

Referring to this species in 1893 Simroth writes:—"Das

einzelne Thier hat einige Eigenthümlichkeiten, welche die Vermuthung nahe liegen, dass reicheres Material zur Aufstellung einer dritten Gattung oder Untergattung zwingen wird. Man wird mir erlauben, mich vorläufig in der Gliederung zu beschränken.

“Die Unterschiede liegen theils in der Hautskulptur, theils in der Schale, theils im Penis.” (3, p. 109.)

The peculiar studded appearance of the mantle and the general form of the animal are scarcely done justice to in Simroth's figure (3, t. vii. fig. 4).

The whole of the mantle, except the thin border surrounding the shell, is studded with a dense series of wart-like bodies; these also appear on the postero-lateral portions of the body (Pl. VII. figs. 3, 4, and 5). When examined with a pocket-lens these are seen to be irregular in size, with still smaller protuberances between the larger ones (Pl. VII. fig. 6). The microscopical structure of the mantle agrees in all particulars with that of *M. javanica*, described below.

To Simroth's description of the shell I am unable to add anything, for in all the three specimens none are exactly alike. One point, however, seems worthy of notice; in what I take to be an old specimen the shell is much thicker and the periostracum shows a tendency to fold itself beneath the calcareous plate, and so gives rise to a slightly thickened rim.

The third point Simroth (*op. cit.*) mentions is the form of the penis, and here there are many important differences from such species as *M. Fruhstorferi*, Simr., and *M. Böttgeri*, which I have compared with *M. javanica* and discussed below.

The Generative Organs.—Simroth's two figures (3, t. vii. fig. 13; and 4, t. xv. fig. 23) of the generative organs are so very different from one another, I have considered it desirable to refigure the same from my own dissections for purposes of comparison.

The vestibule is small; looked at dorsally (Pl. VII. fig. 7) the vagina is seen to open on the left dorsal side, whilst the penis opens into the middle portion, also dorsally. We may divide this latter organ into two parts—a proximal one, having a globose tubular appearance, at the distal end of which the retractor muscle is inserted, and a distal portion, which is the longer of the two, which passes into the vas deferens. Internally the cavity of the penis, commencing from the distal end, is a fine tube, which gradually widens and at the end of the distal division gives off a short blindly-ending portion; below this it passes as a slightly narrower tube into the proximal division running forward; then making a U-shaped bend, it opens into a sac-like expansion, followed by two

similar cavities, only much smaller, the most anterior one opening into the vestibule (Pl. VII. fig. 9).

The retractor muscle is inserted just below the distal division (Pl. VII. fig. 9, *r.m.*), and is conspicuous owing to the fact that the muscle-fibres radiate and form a disk-like point of insertion. The free oviduct is produced into a pouch-like cavity on the left side (looked at dorsally), the external wall of which is minutely pitted, more so perhaps ventrally than dorsally. At the point where the prostatic portion of the common duct joins with the vas deferens the terminal portion of the former is free, though not to such an extent in the specimens I have dissected as figured by Simroth (3, t. viii. fig. 13). The dart-sac opens into the vestibule on the right side; it passes backwards beneath the penis and vagina, and making a sinuous curve, lies to the right of the terminal ducts. Its structure is very similar to that described below for *M. javanica*. The dart (Pl. VII. fig. 10), which is about 2 millim. long, is a slender slightly curved rod with a solid calcareous head.

5. *Microparmarion javanica*, sp. n. (Pl. VIII. figs. 11-19.)

Hab. Geda. Three specimens. Type in coll. of W. E. C.

Animal (Pl. VIII. figs. 11-13) purply brown, darker posteriorly, sides of head lighter. Mantle-lobes same colour but darker, spotted with small black spots; whole of mantle (excepting portion bordering shell) and the postero-lateral portions of the body are studded with minute wart-like protuberances. Peripodial groove distinct. Rugæ large. Foot-fringe greyish brown, with faintly coloured lineoles. Foot-sole divided into median and lateral planes, former yellow in colour, latter purply blue. Keel prominent, yellowish brown. Caudal mucous pore a vertical slit, not extending to the foot-sole.

Length (in alcohol) 25 millim.

Shell (Pl. VIII. figs. 14 and 15) oval in form, solid, amber-colour, the lines of growth strongly and regularly marked; apex distinct.

Major diameter 10 millim., minor diameter 6.5.

The mantle in this species is not unlike that in *M. Austeni*, Simr.; a transverse section through the same showed the following structure:—The epidermal cells in certain areas are covered with a thick yellowish layer of a gum-like substance; these regions are raised up, forming in the section little hillocks; these in the living animal have the appearance of wart-like bodies.

In the depressions between one raised portion and another the epidermal cells have the usual characters, and it is in these depressed areas that the various unicellular glands open to the surface. The pigment is contained in a series of branched connective-tissue cells, which are most numerous around the region of the glands. In all other features the structure agreed very closely with that described by Plate (1) in *Daudebardia*.

The Generative Organs.—There is a large somewhat triangular-shaped vestibule. Looked at dorsally the vagina is seen to open into this on the ventral portion of the right side. The receptacular duct is very short, in fact only when looked at from the ventral side does there seem to be one (Pl. VIII. fig. 17). Dorsally the pyriform receptaculum seminis seems to open directly into the vagina. The penis opens into the middle portion of the vestibule on its ventral side (Pl. VIII. fig. 16). Distally it has a hammer-shaped enlargement, terminating on one side as a beak-shaped process, and on the other gradually becomes smaller and gives place to the vas deferens. When dissected open the penis is seen to have a very different appearance (Pl. VIII. fig. 18), agreeing in this respect with *M. Austeni*, Simr. At the point of junction of vas deferens and penis-tube there is scarcely any perceptible difference; further on the tube widens and forms a cavity in the distal head of the penis; then follows another tube-like portion, this latter dilating and again becoming tube-like, and passing towards the vestibule, it again dilates at its external proximal end. The retractor muscle of the penis is inserted just below the hammer-shaped head. The vas deferens passes beneath the proximal portion of the penis and joins the prostatic portion of the common duct on the ventral side (Pl. VIII. figs. 16 and 17). The intervening portion below this and above the receptaculum seminis is the free oviduct; it is slightly convoluted, gradually enlarging distally, and ultimately widens out into a spirally coiled oviducal portion, whose folds almost hide the prostatic canal; dorsally they entirely do so (*cf.* Pl. VIII. figs. 16 and 17). The albumen-gland and the hermaphrodite-gland and duct are very similar to those in *M. Austeni*, Simr., excepting that the latter is longer and more convoluted. The dart-sac opens into the vestibule on the extreme left, and makes a bend to the right side, passing dorsal to the penis and vagina (Pl. VIII. fig. 16, *d.s.*). It is covered by a loose muscular sheath, the walls of which hide that portion passing across the penis and vagina, so that at first sight it has the appearance of entering the vestibule on the right side. Distally

there is a short retractor muscle, and in this species there is also a short broad muscle arising from the wall of the vestibule and inserted into the wall of the proximal portion of the dart-sac. Beneath the muscular sheath is a thicker muscular coat, which encloses the solid distal portion. The dart is situated in the proximal portion, which lies above the penis and vagina. It is a small fine calcareous rod, slightly spatulate at its head, approaching somewhat the shape of that in *M. Strubelli*, Simr., and about 2 millim. long (Pl. VIII. fig. 19).

Affinities.

This species is undoubtedly closely allied to *M. Austeni*, Simr. It agrees with it in the peculiar nature of the integument of the body and in the general structure of the generative organs. A comparison of figures 7 and 8 with figures 16 and 17 will illustrate this relationship.

M. Austeni, however, differs from *M. javanica* in the following particulars:—

- a. The external form and internal structure of the penis (cf. figs. 9 and 18).
- b. In *M. Austeni* the free oviduct shows a sac-like dilatation opposite to and below the receptaculum seminis.
- c. The dart-sac is not so long as in *M. javanica*, and there are slight differences in the form of the darts.
- d. The prostatic portion of the common duct is in *M. Austeni* terminally free and globose.

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EXPLANATION OF THE PLATES.

PLATE VII.

- Figs. 1, 2. *Parmarion pupillaris*, Humb. Generative organs, showing variations in the form of the receptaculum seminis, penis, &c.
 Fig. 3. *Microparmarion Austeni*, Simr. View from the right side, $\times 2$.
 Fig. 4. Ditto. View from the left side, $\times 2$.

- Fig. 5. Microparmarion Austeni*, Simr. Dorsal view, $\times 2$.
Fig. 6. Ditto. Portion of the mantle, showing the wart-like protuberances, $\times 3$.
Fig. 7. Ditto. Generative organs, dorsal view, $\times 3$.
Fig. 8. Ditto. The same viewed from the ventral side, $\times 3$.
Fig. 9. Ditto. Horizontal section through the penis.
Fig. 10. Ditto. Dart.

PLATE VIII.

- Fig. 11. Microparmarion jaranica*, sp. n. View from the right side, $\times 2$.
Fig. 12. Ditto. View from the left side, $\times 2$.
Fig. 13. Ditto. Dorsal view, $\times 2$.
Fig. 14. Ditto. Dorsal view of the shell, $\times 2$.
Fig. 15. Ditto. Ventral view of the shell, $\times 2$.
Fig. 16. Ditto. Generative organs, dorsal view, $\times 5$.
Fig. 17. Ditto. The same, viewed from the ventral side, $\times 5$.
Fig. 18. Ditto. Horizontal section through the penis.
Fig. 19. Ditto. Dart.

Reference Letters.

<i>d.s.</i> Dart-sac.	<i>r.m.</i> Retractor muscle.
<i>f.ov.</i> Free oviduct.	<i>r.s.</i> Receptaculum seminis.
<i>ov.</i> Oviduct.	<i>v.</i> Vestibule.
<i>p.</i> Penis.	<i>v.d.</i> Vas deferens.
<i>pr.</i> Prostate.	<i>vg.</i> Vagina.

XLVIII.—*Contributions from the New Mexico Biological Station.*—VII. *Observations on Bees, with Descriptions of new Genera and Species.* By T. D. A. COCKERELL and WILMATTE PORTER.

MEGACHILE, Latr.

Cresson, Saunders, and Bingham state that the maxillary palpi are 2-jointed, but Ashmead calls them 4-jointed. We have examined a great many species, including two from Europe, and find in every case three joints to the maxillary palpi!

APIS, Linné.

The maxillary palpi of *Apis* are said by authors to be 1-jointed, but in the honey-bee we find two joints fairly well differentiated.

BOMBUS, Fabr.

Various species examined show 2-jointed maxillary palpi, the basal joint stout, the other slender and cylindrical. *B. Kincaidii*, Ckll., has the maxillary palpi 3-jointed, with two cylindrical joints instead of one.

CROCISA, Latr.

Ashmead says of *Crocisa*, "labial palpi 2-jointed, maxillary palpi 5-jointed." Smith says the maxillary palpi are 2-jointed, labial palpi 5-jointed. Bingham agrees with Smith. In *Crocisa ramosa*, Lep., we find the maxillary palpi 2-jointed, the first joint short and globose, but the labial palpi are only 4-jointed, the suture figured by Bingham and Smith between the second and third long joints being non-existent. The true third joint (*i. e.* the first of the small terminal ones) is very stout.

ASHMEADIELLA, Ckll.

In *A. bigeloviae* (Ckll.) the maxillary palpi are 4-jointed; joint 1 short and broad, 2 longest, 3 and 4 about equal.

ALCIDAMEA, Cresson.

According to Cresson the maxillary palpi of this genus are 4-jointed, but in *Alcidamea simplex* (Cress.), from Kansas, we find the maxillary palpi with five very distinct joints, 1 and 2 short, 3 long and cylindrical, 4 and 5 also cylindrical, 4 a good deal shorter than 3, 5 shorter still and perhaps a little shorter than 1 or 2.

CERATINA, Latr.

The type of this genus is *C. albilabris*, Fabricius, a synonym of *C. cucurbitina*, Rossi. This insect is black, and has 5-jointed maxillary palpi, as stated by Friese and confirmed by us in specimens received from him. Taschenberg and Friese state that the maxillary palpi of *Ceratina* have from 4 to 6 joints; F. Smith says there are 6 joints, the three basal ones about equal, the three apical minute. Ashmead has recently (Tr. Am. Ent. Soc. 1899, p. 69) regarded the species with 6-jointed maxillary palpi as typical *Ceratina*, and has proposed a new genus, *Zaodontomerus* (printed *Zadontomerus*, but corrected by the author in my copy), for those with the maxillary palpi 4-jointed.

We have examined a number of species, and find three with 5-jointed maxillary palpi, seven with 6 joints, and none with 4. Moreover, a specimen of *C. tejonensis*, the type of *Zaodontomerus*, has 6-jointed maxillary palpi. This example of *tejonensis* is an Illinois one, received from Mr. Robertson, and we believe it is correctly identified. It seems not impossible that the records of *Ceratina* with 4-jointed maxillary

palpi are based on broken specimens, as we have found that the loss of one or two joints of a palpus is often very difficult to detect without the use of a high power of the compound microscope.

The species with 5-jointed maxillary palpi are very diverse among themselves, as follows:—

- | | |
|---|--|
| (1) Joint 4 about equal to 5 and not greatly shorter than 3; fourth joint of labial palpus narrow and cylindrical; insect black; apex of abdomen (♂) truncate | <i>cucurbitina</i> , Rossi. |
| (2) Joint 4 conspicuously shorter than 3 or 5 | [(Europe.)] |
| (a) Joint 5 very narrow, only about half width of 3; fourth joint of labial palpus broadly truncate at end; insect with the thorax green, abdomen crimson | <i>amabilis</i> , Ckll. (Tropical Mexico.) |
| (b) Joint 5 nearly as broad as 3; insect black, apex of ♂ abdomen truncate | <i>arizonensis</i> , Ckll. [(Arizona.)] |

These will stand as typical *Ceratina*, though perhaps *amabilis* (with *eximia*, Sm.) might be separated subgenerically. The series will also doubtless be found to include *nigra*, Handl., *bispinosa*, Handl., *nitidula*, Mor., and *parvula*, Sm.

The species with 6-jointed maxillary palpi separate thus:—

- | | |
|--|--------------------------------------|
| (A) Black, with yellow markings; joint 4 of maxillary palpi about equal to 5 | <i>hieroglyphica</i> , Smith. |
| (B) Blue or green. | [(India, China.)] |
| (1) Apex of ♂ abdomen moderately broad, rounded, with a sharp tooth on each side; insect very bright blue or green | <i>viridissima</i> , D. T. |
| (2) No lateral teeth at apex of abdomen; insect dark green or blue. | [(India, Burma.)] |
| (a) Apical portion of ♂ abdomen broader than long. | |
| (i) Apical portion very broad; hind femora of ♂ triangular | <i>tejonensis</i> , Cresson. |
| (ii) Apical portion not so broad; hind femora of ♂ normal | [(U.S.)] |
| (b) Apical portion of ♂ abdomen narrow or pointed. | <i>dupla</i> , Say. (U.S., [Mexico.] |
| (i) Hind femora of ♂ triangular; second submarginal cell subtriangular. | [(Mexico.)] |
| (a) ♀ with a light mark on clypeus .. | <i>nanula</i> , Ckll. (New |
| (b) ♀ with clypeus dark | <i>submaritima</i> , Ckll. |
| (ii) Hind femora of ♂ normal; second submarginal cell subquadrate; ♀ with clypeus dark | [(Washington State.)] |
| | <i>cyanea</i> , Kirby. |
| | [(Europe.)] |

Here are three distinct series—the first consisting of the

Indian and Chinese *hieroglyphica* (with *Morawitzii* and *flavipes*), the second of the Indian *viridissima*, and the third of the ordinary dark green or blue species of Europe and North America.

C. hieroglyphica may be taken as the type of a new subgenus, *Ceratinidia*. Our specimen is from the Khasia Hills, India, sent by Mr. Sladen. The second submarginal cell is less narrowed above than in typical *Ceratina* (*cucurbitina*); and the first recurrent nervure, instead of joining the second submarginal cell at its extreme apex, joins it at about the end of its second third.

C. viridissima has the fourth joint of the maxillary palpus unusually short; the venation resembles that of *Ceratinidia*. It is possible that this insect will fall into *Pithitis*, Klug, which was based on the Javan *C. smaragdula*, Fabr., a species we do not possess.

The remaining species form a fairly compact group, not well separable into subgenera. For this group no subgeneric name has been proposed, unless it may be possible to apply *Zaodontomerus*, Ashm., founded on *tejonensis*. This can be done, if it can be shown that the specimens examined by Ashmead (whether true *tejonensis* or not) had in reality 6-jointed maxillary palpi.

The maxillary palpi in this group afford fairly good specific characters, thus:—

C. cyanea has joint 3 only about half as long as 2 (2 about 150, 3 about 70 μ); 4 and 5 are equal, both short.

C. tejonensis (Illinois) has joint 4 only about half as long as 6; 3 nearly as long as 2, but hardly as long as 6.

C. nanula has joint 3 much shorter than 2.

DIADASIELLA, Ashm., 1899, = ANTHOPHORULA, Ckll., 1897.

We have before us a ♂ type of *D. Coquilletti*, Ashm., kindly sent by Mr. Ashmead. The clypeus is yellow, but the venation is that of *Exomalopsis*, the second submarginal cell presenting no tangible difference. The maxillary palpi are slender and 6-jointed, joint 4 longest, 1 and 5 shortest and about equal. The mandibles are yellow without and the flagellum is orange beneath, but the oblique truncation of the last joint is black. The specimen is from San Diego Co., California.

This insect is manifestly congeneric with *Exomalopsis* (*Anthophorula*) *compactulus*, Ckll., concerning which see Ann. & Mag. Nat. Hist., Dec. 1898, p. 451. Indeed the two are so close together that they might be taken for the same

species without very minute examination. In *E. compactulus* the fourth joint of the maxillary palpus is only about as long as the third, and the sixth is not much longer than the fifth. The first abdominal segment is much more coarsely and strongly punctured in *compactulus* than in *Coquilletti*, and the third transverso-cubital nervure is more bent.

Mr. Ashmead has referred *Anthophorula* to *Eucera*, assuming that the original specimen, with two submarginal cells, is normal. We cannot accept this conclusion, and as our specimens with three submarginals are congeneric with the type of *Diadusiella*, we hold this name to be a synonym of *Anthophorula*. The mouth-parts of *Anthophorula* are, however, practically as in *Exomalopsis*, and it seems that the group with a yellow clypeus in the male has at best only sub-generic value.

XENOGLOSSODES, Ashm.

We have before us three species of this genus, separable as follows :—

- | | |
|---|------------------------------|
| (A) Second joint of maxillary palpus considerably longer than third; fifth very minute; pubescence of abdomen white; wings very short, nervures fulvous | <i>X. albata</i> (Cresson). |
| (B) Second joint of maxillary palpus shorter or not longer than the third; fifth not so minute; pubescence of abdomen pale ochreous. | |
| (1) Larger, flagellum of ♀ black | <i>X. imitatrix</i> , sp. n. |
| (2) Smaller, flagellum of ♀ orange fulvous beneath | <i>X. eriocarpi</i> (Ckll.). |

X. eriocarpi was described as an *Exomalopsis*, but it belongs here. Mr. Ashmead, without examining the mouth-parts, referred it to *Tetraloniella* provisionally, since it agreed fairly well with that genus in venation and also in having the clypeus anteriorly margined with yellow. We have no material of *Tetraloniella* for comparison.

Our material of *X. albata* (♂ ♀) is from Texas (*Belfrage*), and was kindly sent by Mr. Ashmead. The description of the new species follows :—

Xenoglossodes imitatrix, sp. n.

♀.—Length about 12 millim.

Just like the male of *Entechnia grisella* except in the following points :—Face broader, with the vertex flattened as viewed in front (in the *Entechnia* it is rounded); sides of

vertex more or less roughened; punctures of thorax by no means so large or strong; tegulæ smaller, without any reddish tint; costal and subcostal nervures separate; marginal cell smaller and blunter; first submarginal considerably smaller, third more narrowed towards the marginal; transverso-medial nervure of hind wings very oblique (in the *Entechnia* it is very little oblique); hind femora very short and not swollen; spurs dull white; hind tibiæ and tarsi with a rather abundant scopa, hair on inner side of basal joint of hind tarsi pale ferruginous; claws much smaller; abdomen whiter, without bands. Eyes blue-grey. Mandibles blunt, simple. Clypeus, labrum, and mandibles entirely dark.

Blades of maxillæ somewhat pointed; maxillary palpi 5-jointed; basal joint club-shaped, about $120\ \mu$ across at the base and $50\ \mu$ at the apex, $220\ \mu$ long; second joint about $40\ \mu$ wide and 160 long; third $180\ \mu$ long; fourth almost square in outline, $30\ \mu$; fifth $20\ \mu$ wide and 30 long. Labial palpi with the first joint about $1000\ \mu$, second 500 , third 80 , fourth 80 . Paraglossæ $1700\ \mu$; tongue $1780\ \mu$.

♂.—Length 10 millim.

Antennæ long, reaching to middle of first segment of abdomen, somewhat crenulated, entirely black; flagellum without keels; clypeus and labrum white; mandibles with a white spot at base; posterior femora not swollen; abdomen subfasciate as in the male *Entechnia grisella*. The male of *X. albata* differs at once from this by having the flagellum ferruginous beneath and the face-marks quite yellow instead of creamy white.

Hub. Las Vegas, New Mexico, Aug. 8 (A. Garlick). Others taken subsequently by W. Porter. All were found at the flowers of *Sphaeralcea lobata*, Wooton.

Ashmead says of *Xenoglossodes* that the last two joints of the maxillary palpus united are scarcely longer than the third; we find them not so long.

ENTECHNIA, Patton.

A. Mesothorax with an angular band of black hair; scutellum with black hair.

(1) *E. taurca* (Say). Illinois to Georgia.

(2) *E. fulvifrons* (Smith). Texas to South America.

B. Pubescence of thorax dense, entirely pale ochreous.

a. Abdomen with distinct bands.

(3) *E. dakotensis*, sp. n. Dakota.

b. Abdomen uniformly covered with a velvety pile.

(4) *E. grisella*, sp. n. New Mexico.

Entechnia grisella, sp. n.

♂.—Pubescence pale yellowish grey, short and dense, especially on the abdomen, where it resembles velvet. Antennæ short, about $3\frac{1}{2}$ millim. long, black; first joint of flagellum about three times as long as second; face wholly dark, facial quadrangle somewhat longer than broad; ocelli large, in a curve; vertex punctured behind the ocelli, smooth and shining at the sides; clypeus and labrum well punctured, the latter large, quadrate; mesothorax and scutellum with large close punctures; tegulæ rather large, brownish testaceous; wings clear, nervures dark brown; costal and subcostal nervures united by chitin, forming a very thick costal margin; stigma minute, little developed; marginal cell lanceolate, the apex away from the costa; first submarginal cell only a little longer than third; second shortest, a little narrowed above, receiving the first recurrent nervure near the end; third narrowed about half to marginal, receiving the second recurrent nervure near its end; median and submedian cells practically equal on the externo-median nervure. Legs black, with short pubescence; claws deeply cleft, pulvillus large; hind femora swollen basally; spurs black; basal joint of hind tarsi long and slender, gently curved; abdomen with the pubescence on hind margins of segments 2 to 4 whiter than the rest, producing the effect of bands.

Length about 11 millim.

Hab. La Cueva, Gallinas River, S. of Las Vegas, New Mexico, Aug. 6, 1899 (*W. Porter*).

The first joint of the labial palpus is much less than half the length of the second, and the first joint of the maxillary palpus is conspicuously longer than the second.

Entechnia dakotensis, sp. n.

♀.—Length 12 millim.

Similar to *E. grisella*, but broader, with the abdominal pubescence scanty enough to give the effect of dust on a black surface, except for the three very distinct white bands on the hind margins of segments 2 to 4. Apex of abdomen with dark fuscous hair; ventral segments fringed with dark hair; hind tibia and basal joint of tarsus with a long loose scopa of brown-black plumose hair. Flagellum brownish towards the end.

Hab. Hot Springs, Dakota (*L. Bruner*, no. 22).

It is just possible that *E. dakotensis* is the female of *E. grisella*, but the wide difference of locality and the conspicuous

difference in the ornamentation of the abdomen make this seem improbable. We wrote to Prof. Bruner for further information about *E. dakotensis*, and he replies:—"The *Entechnia* was represented in my collection by three female specimens. The young man who collected these said that he might have taken hundreds of them had he known that they were of any particular value, since the bank was full of them."

Comparing *E. grisella* with the published accounts of *Entechnia*, we thought it seemed generically distinct; but on comparing specimens of the several species, we found them structurally identical within generic limits. We find only five joints to the maxillary palpi; but the first joint, which is very long, is slightly constricted at the middle, and on this account was taken by Patton for two equal joints. The small apical joints are constructed much as in *Xenoglossodes*. As regards the mouth-parts *Entechnia* is to *Xenoglossodes* somewhat as *Eulema* is to *Bombus*.

SYNHALONIA, Patton.

Ashmead says of typical *Synhalonia*, "abdomen in female black, not fasciate." This is black; apply to *S. atriventris* (Smith), which, however, is not mentioned by Patton in his original account of the genus. The type of *Synhalonia* is *S. fulvitaris* (Cresson), which in the female has a more or less distinct pale band on the second abdominal segment. The differences in the venation between *Synhalonia* and *Eusynhalonia*, Ashm., seem unsatisfactory, and at most of specific value. In view of these facts it is probable that *Eusynhalonia* cannot be maintained.

Synhalonia crenulaticornis (*Melissodes crenulaticornis*, Ckll., Ann. & Mag. Nat. Hist., Dec. 1898, p. 454) is peculiar in having the first joint of the labial palpi relatively short, not twice the length of the remaining three together, as it is in *S. frater* and *atriventris*.

OXÆA, Klug.

Mr. Ashmead has kindly sent us a male *O. flavescens*, Klug, collected in April at Chapada, Brazil. We find the maxillary palpi to be absent, as stated by authors; and it becomes clear that *O. gloriosa* (Fox), which has 6-jointed maxillary palpi, must fall in another genus, which we propose to call *Protoxæa*. The two genera are separable thus:—

- (1) Apical plate of ♂ abdomen subtruncate, with rounded corners; tongue short, broad at base, filiform at apex,

much like that of *Cylissa*, covered with branched hairs; paraglossæ almost half the length of the tongue, narrow, inner margin covered with branched hairs; labial palpi short, the second, third, and fourth joints together not so long as the first, about equal to one another; blade of maxilla much shorter than stipes; maxillary palpi 6-jointed, 1 very short, almost rudimentary, 2 and 3 equal, 4 somewhat shorter, 5 a little shorter than 4, 6 narrowly cylindrical and about as long as 4

Protoxæa, gon. nov. (Type
[*Protoxæa gloriosa*, Fox.]

- (2) Apical plate of ♂ abdomen hispidose; tongue much longer and narrower, not nearly so broad at base; paraglossæ relatively shorter; labial palpi with the first joint much longer, more than twice the length of the other three together; maxillary palpi wanting; blade of maxilla larger and thicker

Oxæa, Klug. (Type *O. flavescens*, Klug.)

O. vagans, Fox, placed by Friese in the same group as *gloriosa*, appears from the description to be a true *Oxæa*.

Oxæa may well be taken as the type of a distinct subfamily, Oxæinæ, as suggested by Ashmead, but it appears to us to be related to the Andrenidæ, and by no means to the Xylocopidæ. The genus *Lestis*, Lepel., from Australia, is associated by Mr. Ashmead with *Oxæa*; but we have examined an example of *L. bombylans* (Fabr.), kindly sent by Mr. Ashmead, and find that it is a true Xylocopid, very remote from *Oxæa*. The peculiarly formed blade of the maxilla, and especially the characteristic spatulate lamella close to the maxillary palpus, are essentially as in *Xylocopa*.

MEGACILISSA, Smith.

We have before us an excellent series of *M. Yarrowi*, Cresson, collected by Prof. C. H. T. Townsend at La Cueva, Organ Mts., New Mexico, alt. 5300 feet, Sept. 5, at flowers of *Datura meteloides* before sunrise. Two specimens were taken Sept. 4, also before sunrise, at flowers of *Lippia Wrightii*. The early flight of this bee, from 5.15 to 6.15 A.M., as observed by Prof. Townsend, is very interesting.

Except that the scopa on the hind legs is white instead of dull brown, *M. Yarrowi* exactly agrees with the description of *M. superba*, Smith, the type of *Megacilissa*. It is indeed possible that the two are one species, but at all events they

must be congeneric. The second submarginal cell is subtriangular and about half the size of the third.

It seems questionable whether *Megacilissa* can be separated from *Caupolicana*, Spinola, which has two years priority over it; but it may be that the species with green abdomens, referred by Friese to *Megacilissa*, should be generically separated. In any event, typical *Megacilissa* is the form with a black, white-banded abdomen, and not the green type, as Friese has it. We do not propose a name for the latter group, having no specimens.

CALLIOPSIS, Smith.

Calliopsis teucriti, sp. n., Ckll.

♀.—Length $6\frac{1}{2}$ millim.

Black; appearance of *C. andreniformis*, with the same abdominal hair-bands, which are pale ochreous. Clypeus entirely black, the only pale marks on face are a couple of round or subquadrate white spots contiguous with the orbital margins at the level of the supraclypeal area. Mandibles rufescent about the middle; flagellum yellowish beneath towards the end; scape strongly and densely punctured; front below ocelli very closely punctured; clypeus with large punctures on a shining surface; tegulæ shining piceous; mesothorax and scutellum very closely punctured; abdomen with a minutely roughened sericeous surface; spot on tubercles and an interrupted stripe on hind border of prothorax white; legs dark, with the tarsi pale ferruginous, and the anterior and middle knees with a small white spot; wings rather smoky; marginal cell obliquely truncate; second submarginal cell narrowed considerably more than half to marginal; middle femora flattened to an acute keel beneath.

Hab. Las Vegas, New Mexico, July 11, 1899 (Ckll.). One at flowers of *Teucrium laciniatum*.

Calliopsis verbenæ, sp. n., Ckll. & Porter.

♀.—Length about $8-9\frac{1}{2}$ millim.

Black, with grey pubescence arranged about as in *C. coloradensis*. Head transversely oval, facial quadrangle a little broader than long; vertex seen from in front rounded; a smooth shining space on each side of the ocelli, but vertex otherwise strongly punctured; clypeus shining, with large sparse punctures; face moderately hairy; antennæ short, dark, the flagellum obscurely brown beneath; clypeus with the anterior edge black, but just before it a transverse band of

creamy white, which is narrow in the middle, but abruptly enlarged, forming quadrate patches, at the sides; the lateral creamy-white face-marks are not far from equilateral triangles; no supraclypeal or dog-ear marks; labrum with a transverse white patch; mandibles dark; thorax quite hairy; mesothorax shiny, but strongly punctured except a posterior smooth area; base of metathorax smooth and shining, with a large median pit, made double by a longitudinal transverse ridge; tegulae dark brown in front, pale brown behind; wings perfectly clear, nervures and stigma dark brown, stigma very little developed; marginal cell obliquely truncate; second submarginal narrowed about one half to marginal, and receiving the recurrent nervures at about the end of the first and beginning of the last fifth; legs black, even to the tarsi, with pale pubescence; middle femora curiously flattened and broadened, the lower knife-like edge having a very short brush of orange-fulvous hairs; basal joint of middle tarsi also flat and broad; abdomen strongly but not densely punctured, with the usual thin hair-bands; hair at apex pale.

♂.—About 7 millim. long. Face more hairy; white markings more conspicuous; clypeus creamy white, with a black mark on each side of its hind margin; lateral face-marks rather more produced along the orbital margin than in the female; basal part of mandibles mostly white; anterior knees and anterior tibiae in front yellowish; spurs whitish; tarsi sordid whitish, the small joints brown, quite dark on the middle and hind tarsi.

Hab. Las Vegas, N. M., Aug. 9, several at flowers of *Verbena stricta* (W. Porter).

Calliopsis chlorops, sp. n., Ckll.

♂.—Length $5\frac{1}{2}$ – $6\frac{1}{2}$ millim.

Black with grey and white pubescence. Head transversely suboval; eyes prominent, in life yellowish green; face and cheeks with fairly abundant white hair, not dense enough to hide the surface; face-markings pale yellow, including the clypeus, lateral marks, supraclypeal mark, dog-ear marks, labrum, and mandibles except their reddish tips; the face would be all yellow below the level of the antennae, except the rather obscure clypeal dots, but for the fact that below each dog-ear mark is a small triangle of black, bounded by the clypeus, lateral mark, and dog-ear mark; lateral marks rapidly narrowing from the upper margin of the dog-ear marks to an acute point on the orbital margin less than the length of the scape above the level of the antennal sockets;

flagellum brown beneath, except at the extreme base; vertex somewhat roughened; mesothorax dull, densely and strongly punctured; base of metathorax evenly and delicately longitudinally ridged; pubescence of thorax grey above, white on pleura and sides of metathorax; tubercles dark; prothorax with a small yellow line on each side of the hind margin; femora black, with yellow knees; tibiae yellow in front and black behind; basal joints of tarsi cream-colour, of hind tarsi blackened behind; small joints brown; tegulae brownish hyaline; wings clear, nervures and stigma dark brown; stigma almost obsolete; marginal cell appendiculate; second submarginal long, narrowed about half to marginal, receiving the first recurrent nervure about the end of its basal fourth, and the second about the beginning of its apical sixth; abdomen very closely punctured, the hind margins of the segments pallid, with very thin hair-bands; hair at apex white.

Hab. Las Vegas, N. M., at flowers of *Grindelia squarrosa*, Aug. 9 and 14 (*W. Porter*); also one at flowers of *Verbesina encelioides*, Aug. 12 (*Ckll.*).

PERDITA, Smith.

Mr. Ashmead, in dividing the old genus *Perdita*, has used the relative lengths of the joints of the labial palpi for diagnostic purposes. In some groups the first joint is twice the length of the other three together, or even more than twice, while in others it is not nearly so long. In the following table we give the measurements in μ of a number of labial palpi; first the length of the first joint, then that of the other three together, then the latter in percentage of the former:—

	First joint.	Last three.	%
<i>P. (Tetraperdita) sexmaculata</i> , Ckll.	430	150	34
<i>P. sphaeralcea</i> , Ckll.	750	280	38
<i>P. (Cockerellia) verbesina</i> , Ckll.	800-900	370-380	42-46
<i>P. (Cockerellia) albipennis</i> , var. <i>hyalina</i> , Cress.	1050	500	47
<i>P. (Pentaperdita) albobittata</i> , Ckll.	680	330	48
<i>P. salicis</i> , Ckll.	350	180	51
<i>P. affinis</i> , Cress.	760	430	56
<i>P. sida</i> , Ckll.	350	200	57
<i>P. (Perditella) larrea</i> , Ckll.	420	240	57
<i>P. Townsendi</i> , Ckll.	800	470	58
<i>P. rhodura</i> , Ckll.	500	300	60
<i>P. Woottonae</i> , Ckll.	580	300	67
<i>P. luteola</i> , Ckll.	450	310	69
<i>P. phaeotheca</i> , Ckll.	330	220	69

	First joint.	Last three.	%.
<i>P. æneifrons</i> , Ckll.	560	400	71
<i>P. mentzeliae</i> , Ckll.	560	400	71
<i>P. bigeloviae</i> , Ckll.	480	350	72
<i>P. zebrata</i> , Cress.	450	350	77
<i>P. mentzeliarum</i> , Ckll.	400	320	80
<i>P. grandiceps</i> , Ckll.	320	260	81
<i>P. semicrocea</i> , Ckll.	270	240	88

Perdita sphaeralceæ cannot be a *Cockerellia*, as the claws are cleft in both sexes. *Neoperdita*, Ashm., was proposed for just such forms, judging from the diagnosis; but unfortunately *Perdita zebrata*, having very differently formed labial palpi, is given as the type species.

Pentaperdita, subgen. nov., is proposed for *P. albovittata*, which has 5-jointed maxillary palpi, these palpi in the ordinary species having 6 joints. The claws are all cleft in the male, simple in the female. The face-markings are the same in both sexes.

Tetraperdita, subgen. nov., is proposed for *P. sexmaculata*, which has 4-jointed maxillary palpi, and the first joint of the labial palpi excessively long. Claws simple in the female, cleft in the male. Mandibles simple. Abdomen dark, with light spots.

Geoperdita, subgen. nov., is proposed for *P. chamæsarachæ*, Ckll., which has the labial palpi only 3-jointed, i. e. with one long joint and two small ones; while the maxillary palpi are quite rudimentary, with 1 to 3 vaguely indicated joints.

Perditella, Ckll., is a subgenus based on *P. larreæ*, with its curious venation and toothed cheeks. The maxillary palpi are slender and 6-jointed. *P. marcialis* also belongs to this subgenus.

Cockerellia, Ashm., may be held to include *P. albipennis*, *P. sparsa*, *P. verbesinæ*, *P. lepachidis*, and *P. utahensis*. *Philoxanthus*, Ashm., seems hardly separable from *Cockerellia*.

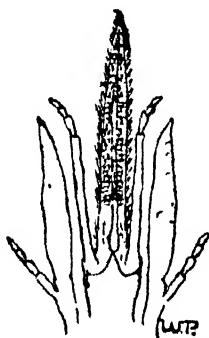
Perdita, s. str., can never be certainly determined until new specimens are obtained; Smith's unique type, with the palpi lost, is cited vaguely from "North America." *P. semicrocea* resembles Smith's *P. halictoides* in its style of coloration, and may provisionally be regarded as typical; but there are other species, e. g. *P. chamæsarachæ*, which are also similarly coloured, but differ greatly in the mouth-parts.

A new description of *P. sexmaculata* is offered, the original description, from the female only, being rather too brief:—

Perdita (Tetraperdita) sexmaculata, Ckll.

♀.—About $4\frac{1}{2}$ millim. long.

Very shiny, with thin white pubescence on the cheeks, pleura, legs, and end of abdomen, but little elsewhere. Head and thorax dark olive-green, clypeus and supraclypeal area black; face wholly dark; scape black, coarsely punctured or malleate; flagellum brown above, yellowish beneath; clypeus and sides of face with sparse but distinct punctures; labrum with a group of about six large punctiform depressions on each side; mandibles yellowish ferruginous towards the tips; frontal foveæ black grooves; facial quadrangle slightly broader than long; vertex granular or minutely tessellate; mesothorax and scutellum smooth and very shiny, with a very few scattered punctures; base of metathorax dark blue, contrasting with the olive-green scutellum and postscutellum; tegulæ brown in front, whitish behind; wings clear, nervures and stigma dark sepia-brown; stigma pallid in the middle; recurrent and transverso-cubital nervures broken by hyaline dots; marginal cell obliquely truncate, the poststigmatal portion about equal to the substigmatal; second submarginal cell narrowed more than half to marginal, forming an equilateral triangle with the upper angle cut off; third discoidal distinct; legs black, anterior tibiæ yellowish in front; abdomen flat, shining black, with six round yellowish-white spots at the sides of segments 2 to 4; venter black.



Perdita sexmaculata, Ckll.

♂.—About 4 millim. long.

Very shiny, with thin white pubescence on the cheeks, pleura, and end of abdomen; fairly abundant pubescence on the legs, and widely scattered white hairs on the rest of the body; head and thorax dark green; mesothorax almost

black; metathorax granular, dark bluish; face yellow, yellow extending above the antennæ half the length of the scape, but the dark colour sending angular projections into the yellow as far as the sockets of the antennæ; a yellow line (half the length of the scape) runs up the anterior orbital margin a short distance above the general level of the yellow; a yellow band extending halfway up on the posterior orbital margins; scape yellow, tipped at both ends with light orange; flagellum light orange, marked with black above near base; mandibles with light brown tips and margins; frontal foveæ elongate-oval; cheeks unarmed; tubercles yellow; legs yellow, under-side of hind femora black, the tarsi becoming brownish; abdomen above shining black, with a pale cream spot at each side of segments 2, 3, 4, and 5, those on 5 smaller and more nearly circular than those on 2, 3, and 4; wings clear and iridescent.

Redescribed from numerous specimens taken at Las Vegas, N. M., at flowers of *Chamæsaracha coronopus*, during the first half of August. The male, in the table of *Perdita* in Bull. Denison Lab. 1898, runs to *P. salicis*, but has not a banded abdomen. *Perdita punctata* (*P. sexmaculata*, var. *punctata*, Ckll. Proc. Philad. Acad. 1896, p. 71) is a perfectly distinct species.

MACROTEROPSIS, Ashm.

Ashmead says of this, "palpi as in *Microtera*, Smith." Examining *M. latior* (*Perdita latior*, Ckll.) we find the labial palpi 4-jointed, with the first joint longer than the remaining three together, and very broad and flat, as in the long-tongued bees, ending in a sharp claw-like point. The last three joints are narrow and cylindrical, subequal in length, but the first sometimes the longer, and the last the shorter, of the three. The second joint is attached to the side of the first, well before the end of the latter. The maxillary palpi are short, rather pale, and 4-jointed, with variations to 5 and 6, owing to the subdivision of the terminal joints; in the 6-jointed form there are three short joints, namely 3, 4, and 5. These palpi must be regarded as in a subrudimentary condition, which accounts for their variability, as in the more extreme case of *Geoperdita*. The tongue is narrow, with a blunt tip, and extends very little beyond the labial palpi.

It had formerly seemed possible that *Macroteropsis* might be the true *Macrotera*; but this cannot be if Smith's description and figures are worth anything. A second species of the genus is *Macroteropsis texanus* (*Macrotera texana*, Cress. Trans. Am. Ent. Soc. 1878, p. 70).

CALLANDRENA, Ckll.

Callandrena pectidis (Ckll.). (*Panurgus pectidis*, Ckll. Tr. Am. Ent. Soc. 1897, p. 148.)

This has a broad galea, and the labial palpi have the first joint stout and curved, the third shortest, the fourth very narrow. The curved basal joint of the labial palpi is especially characteristic, and shows its affinity with the *pulchella* group of *Andrena*.

HESPERAPIS, Ckll.

Hesperapis rhodocерatus (Ckll.). (*Panurgus rhodocерatus*, Ckll. Tr. Am. Ent. Soc. 1897, p. 148.)

Hesperapis olivice (Ckll.). (*Panurgus olivice*, Ckll. t. c. p. 149.)

In *H. rhodocерatus* the tongue is very short, broad at base, the apex linear, with diverging branchlets; labial palpi as in typical *Hesperapis*; maxillary palpi short, 6-jointed, 1 only about twice as long as broad, 2 very little longer than 3 or 6, 4 as broad as 3, only 6 very slender.

The dagger-like tongue with a linear fimbriate tip at once separates this genus from *Rhophitoides*.

In *Rhophitoides canus* the tongue is long, slender, parallel-sided, with the end flattened and rounded, covered with little conical projections; the labial palpi also are different from those of *Hesperapis*, having the first two joints remarkably stout and large and about equal in length.

HYPOMACROTERA, gen. nov. (Panurginæ.)

Type *H. callops*, sp. n. Includes also *H. subalpina* (*Calliopsis subalpinus*, Ckll. 1894).

Head broad, transversely oval; wings with a black apical spot in the male; marginal cell long and narrow, obliquely subtruncate at the end; two submarginal cells, the second about or nearly three quarters the length of the first, both being long; tongue short, fairly broad; paraglossæ short; labial palpi 4-jointed, the first joint longer than, but not nearly twice as long as, the other three together; maxillary palpi 6-jointed; claws cleft.

This differs at once from *Macrotera*, Smith, by the much shorter tongue and the long narrow marginal cell. It resembles it in the narrow stigma and also quite closely in the palpi. In addition to the two species cited, it includes

also *Calliopsis semirufus*, Ckll., but that is probably the female of *H. subalpina*. The tongue is broader in the female *H. callops* than in the male.

Hypomacrotera callops, sp. n.

♂.—Length about $5\frac{1}{2}$ millim.

Shining black, with white pubescence, which is long and conspicuous on the face, cheeks, thorax, and end of abdomen, but dense only on the lower part of the face, where it overlaps the clypeus and forms a white beard; head transversely oval, facial quadriangle broader than long; eyes blue-grey; clypeus, labium, and lateral face-marks white, the latter triangular; clypeus with the usual two black dots; labrum with a black spot in the middle; mandibles white, with rufous tips; front smooth and very shiny; ocelli in a slight curve; antennæ black, flagellum very pale yellowish brown beneath; thorax very smooth and shiny; hind parts of scutellum and post-scutellum punctured; extreme base of metathorax roughened; tegulæ hyaline; wings clear, the apex unusually produced, rounded, black; nervures dark brown; stigma very narrow, almost linear, hyaline, with a brown margin; marginal cell very long, narrow, appendiculate; second submarginal cell narrowed less than half to marginal; legs black and white; femora black, apical portion of anterior femur white in front, four hind knees white; tibiæ white, with black patches, anterior one with a patch behind, the others with one on each side, occupying a large part of the surface; tarsi white, the last joint of middle tarsus and all the small joints of hind tarsus black; abdomen obpyriform seen from above, black without marks, hairy at the end.



Hypomacrotera callops, ♀

♀.—Length about 7 millim.

Face black; mandibles brown, with dark brown tips and

margin; antennæ brown, scape and lower part of flagellum dark brown or black; wings without black tips, clear throughout, apices not quite so produced, marginal cell not so long and narrow; legs black; hair at apex of abdomen dirty white.

Hab. Las Vegas, New Mexico, at flowers of *Chamæsaracha coronopus*, Aug. 1 to 4 (Ckll. & W. Porter).

HALICTOIDES, Nyl.

The type of this genus is *H. dentiventris*. Various species assigned here present considerable structural differences, as follows:—

- | | |
|--|------------------------------|
| (A) Labial palpi with joint 1 longer than the other three together; joint 2 not one fourth the length of 1; abdomen of ♂ toothed at sides beneath. (<i>Halictoides</i> , s. str.) | <i>dentiventris</i> , Nyl. |
| (B) Labial palpi with joint 1 not nearly so long as the other three together; joint 2 about three quarters length of 1; galea rather long; abdomen of ♂ simple, except that the last ventral segment has a longitudinal keel. (<i>Ephalictoides</i> , subgen. nov.) | <i>marginatus</i> , Cresson. |
| (C) Labial palpi with joint 1 rather shorter than the other three together; joint 2 about half the length of 1. (<i>Parahalictoides</i> , subgen. nov.) | |
| (1) Shortest joint of maxillary palpi less than half the length of the longest; joints 1 and 2 large, the others small. | <i>Tinsleyi</i> , Ckll. |
| (2) Shortest joint of maxillary palpi more than half the length of the longest. | |
| (a) Head in ♂ transversely oblong; abdomen of ♂ with a subapical ventral tuft | <i>campanulæ</i> , Ckll. |
| (b) Head in ♂ longitudinally oblong; abdomen of ♂ without a subapical ventral tuft | <i>paradoxus</i> , Moraw. |

H. campanulæ may be taken as the type of *Parahalictoides*.

HEMIHALICTUS, Ckll.

Ashmead has referred this to *Dufourea*, but the mouth-parts are widely different, as follows:—

Hemihalictus lustrans (Ckll.).—Tongue short, broad at base; paraglossæ broad, much more than half the length of the tongue; galea broad and thin, notched within, the apical portion beyond the notch with large bristles; first

of maxillary palpi shortest. These characters, except the long paraglossæ, agree with *Halictus*.

Dufourea vulgaris, Schenck.—Tongue long and narrow; paraglossæ slender, not half the length of the tongue; galea tapering, with bristles along its whole length; maxillary palpi with joint 1 longest, but barely longer than 2, the others shorter, but still long.

Mesilla Park, New Mexico, U.S.A.,
Sept 25, 1890.

XLIX.—*Rhynchotal Notes*.—III. Heteroptera: Discocephalinæ and Pentatominæ (part.). By W. L. DISTANT.

THIS third contribution is a continuation of the two previous papers under the same title (*ante*, pp. 29 and 213). As the unavoidable synonymical correction to Walker's work progresses (in addition to the same species being described by that author under different genera, his descriptions are frequently vague in the extreme), one cannot wonder at Continental entomologists proposing to ignore his work altogether, as was done by Stål in 1862 ('Journal of Entomology,' vol. i. p. 481) in relation to the list of Homopterous insects which had then appeared. This course, it is needless to say, cannot be followed, though I have myself felt the great inconvenience—to use no stronger term—of sinking some of my own species when, to employ a parabolic expression, I found that my snipe had been previously described by Walker as pigeons. A more drastic treatment has, however, been advocated for Walker's species of Coleoptera by Bates (*Ann. & Mag. Nat. Hist.*, January 1886) and by Dr. Sharp (*Trans. Ent. Soc. Lond.* 1890, p. 339).

DISCOCEPHALINÆ.

Genus DISCOCEPHALA.

Discocephala scutellata.

Discocephala scutellata, Sign. *Ann. Soc. Ent. Fr.* 1851, p. 334

Discocephala marmorea, Dall. (nec Lap.) *List Hem. i.* p. 146 (1851).

Discocephala marmorea.

Discocephala marmorea, Lap. *Hém.* p. 57, pl. liv. fig. 5 (1832).

Discocephala deplanata (part.), var. β , Walk. *Cat. Het. i.* p. 185. n. 21 (1837).

Discocephala deplanata.

Discocephala deplanata (part., excl. var. β), Walk. Cat. Het. i. p. 185. n. 21 (1867).

Discocephala Daagæ, sp. n.

Ochraceous, thickly covered with coarse dark brown punctures; scutellum with the apex pale ochraceous and with a small ochraceous spot in each basal angle; body beneath and legs ochraceous, thickly brownly punctate, a central sternal spot and a broad central fascia to the abdomen piceous; stigmatal spots piceous; femora sparingly punctate, the punctures reddish; antennæ ochraceous, the two apical joints wholly brownish.

The lateral margins of the head are distinctly convexly sinuate a little in front of eyes; the lateral margins of the pronotum are narrowly ochraceous and impunctate; the scutellum is distinctly sinuate at about the centre.

Long. 6-7 millim.

Hab. West Indies (*sic*). Coll. Dist.

Some twenty years ago I acquired five specimens of this species, for which I could obtain no better locality than "received from the West Indies." It has since remained undescribed in my collection, as I hoped to obtain the name of the island where it is found. This still remains an enigma, and I describe the species. The convexly sinuate lateral margins of the head in front of eyes is a prominent character.

Genus CATAULAX.

Cataulax varicornis.

Pentatoma varicornis, Walk. Cat. Het. ii. p. 291. n. 52 (1867).

Cataulax decoloratus, Walk. *loc. cit.* iii. p. 564 (1868).

Genus DINOCORIS.

Dinocoris guttatopunctatus.

Edessa guttatopunctatus, Fabr. Syst. Rhyng. p. 152 (1803).

Antiteuchus? griseus, Dall. List Hem. i. p. 165. n. 7 (1851).

Discocephala signata, Walk. Cat. Het. i. p. 188. n. 27 (1867).

Dinocoris amplus.

Discocephala ampla, Walk. Cat. Het. i. p. 187. n. 26 (1867).

BRAUNUS, gen. nov.

Head much longer than broad, in front of eyes three times the length of the anteocular area; profoundly emarginate in

front; lateral lobes longer than the central, their apices rounded and subfoliaceous, the lateral margins angularly sinuate about midway between eyes and apex; eyes exserted. Pronotum with a long and strong spine at each anterior angle of the lateral margins and with a much smaller spine before the posterior angles, which are broadly and laminately produced, their apices subtruncate, but broadly and acutely sinuate. Scutellum of about half the length of abdomen, apex narrowed and rounded. Corium with the apex extending a little beyond scutellum, its outer margin moderately convex; membrane reaching apex of abdomen, veins coarse and reticulate. Rostrum extending a little beyond posterior coxæ. Antennæ mutilated. Margins of the abdomen amplified posteriorly and obtusely dentate at segmental apices.

Allied to *Coriplatus*, but separable at once by the length of the scutellum as well as by the other characters detailed.

Braunus sciocorinus.

Coriplatus sciocorinus, Walk. Cat. Het. i. p. 197. n. 3 (1867).

Hub. Archidona.

PENTATOMINÆ.

Genus OCHLERUS.

Ochlerus discolor, Walk. Cat. Het. i. p. 194. n. 15 (1867), queried by Lethierry and Severin as a variety of *Ochlerus marginatus*, Fabr. (Cat. Gén. des Hém. t. i. p. 91), belongs to the genus *Brachystethus*, and is identical with the species subsequently described by Walker as *Brachystethus marginifer* (Cat. Het. iii. p. 456, 1868). Its specific position will be decided when that genus is arranged.

Genus LINCUS.

Lincus rufospilotus.

Pentatoma rufo-spilota, Westw. in Hope Catal. i. p. 44 (1837).

Ochlerus vilis, Walk. Cat. Het. i. p. 190. n. 18 (1867).

HEMINGIUS, gen. nov.

Body oblong. Head moderately long, central lobe a little longer than the lateral lobes, obscurely toothed in front of eyes, from which the lateral margins are deeply sinuate; antennæ five-jointed, the basal joint moderately incrassated and extending beyond the apex of the head; eyes very large

and slightly reflexed. Pronotum moderately convex, deflected anteriorly, with a distinct tooth at each anterior angle, the lateral margins very slightly sinuate, posterior angles subprominent, posterior margin in front of scutellum truncate. Scutellum reaching the apex of the abdomen, broad, profoundly concavely sinuate about centre, the apex rounded, moderately gibbous at base. Corium not reaching lateral margin of abdomen, membrane covered by scutellum. Body beneath moderately convex, abdomen with a broad obtruse central sulcation; rostrum extending to nearly half the length of abdomen.

Hemingius scaber.

Ochlerus scaber, Walk Cat. Het. i p. 195. n. 17 (1837).

Hab. Amazons, Tapayos.

Walker, in his diagnosis of this species, describes the scutellum as "more than half the length of the abdomen," whereas it reaches the apex of the abdomen and forms one of the principal characters on which I have been compelled to found the above genus.

Genus THESEUS.

Theseus modestus.

Pacilometis modestus, Stål, Ann. Soc. Ent. Fr sér. 4, t. v. p. 166 (1865).

Pacilometis plenus, Walk. Cat. Het. i. p. 211. n. 16 (1837).

Theseus modestus, Leth. & Sev. Cat. Gén. Hémi. i. p. 95 (1893).

Pacilometis modestus, Leth. & Sev. *loc. cit.* p. 96.

Genus SPUDEUS.

Spudeus lyricus, sp. n.

Dull ochraceous, thickly and finely punctured with piceous. Pronotum with the lateral angles subprominent and its disk having two dark central fasciæ with their apices curved and "lyre-like." Scutellum with the lateral angles and two discal oblique spots piceous. Corium with the lateral area tinged with carmine, somewhat inwardly margined with piceous punctures. Membrane with the base and veins piceous. Body beneath paler than above, with broad sub-lateral piceous margins, the extreme lateral margins ochraceous. Femora and anterior and intermediate tibiæ ochraceous, spotted with brownish, femoral bases immaculate; posterior tibiæ piceous, with a broad subbasal ochraceous annulation; tarsi ochraceous, the apical joint brownish. Rostrum reaching

the fourth abdominal segment. Antennæ castaneous, bases of the second and third joints (narrowly) and base of the fourth joint (broadly) ochraceous; fifth joint mutilated.

Long. 13 millim.; exp. pronot. angl. $6\frac{1}{2}$ millim.

Hab. North-west Australia; Roebuck Bay. One specimen (Brit. Mus.).

Genus EUMECOPUS.

Eumecopus conspersus.

Pæcilometis conspersus, Walk. Cat. Het. i. p. 209. n. 13 (1867).

Eumecopus australasia.

Cimex australasia, Don. Ins. New Holl., Hem. pl. iii. fig. 6 (1805).

Pæcilometis cognatus, Walk. Cat. Het. i. p. 210. n. 14 (1867).

Eumecopus armatus.

Cimex armatus, Fabr. Syst. Ent. p. 702 (1775).

Pæcilometis ruficornis, Walk. Cat. Het. i. p. 208. n. 11 (1867).

Pæcilometis calidus, Walk. loc. cit. n. 12.

Eumecopus superbus, sp. n.

Pronotum, scutellum, membrane, antennæ, and legs black; lateral margins and a narrow central fascia to pronotum, apical lateral margins and apex of scutellum, corium, basal areas of femora, basal halves of anterior and intermediate tibiæ, and less than basal half of posterior tibiæ, tarsi, extreme apex of second joint of antennæ, rather less than basal halves of third and fourth joints, and fifth joint excluding apex ochraceous. Head ochraceous, with four longitudinal castaneous fasciæ. Body beneath castaneous, darkest on sternum; head beneath with longitudinal fasciæ, lateral sternal margins, lateral abdominal margins, and abdominal central sulcation ochraceous.

Rostrum reaching fourth abdominal segment; antennæ with the first joint about three times and the third joint about four times the length of the second, third and fourth joints subequal in length and considerably longer than fifth. Head with the castaneous fasciæ excavate and punctate. Pronotum coarsely punctate, excluding the central fascia. Scutellum coarsely punctate and rugulose, its ochraceous apex more sparingly punctate, its extreme apex bifid. Corium thickly and coarsely punctate.

Long. 27 millim.; exp. pronot. angl. 12 millim.

Hab. Western Australia, Champion Bay (*E. H. Saunders*). One specimen (Brit. Mus.).

Eumecopus mimicus, sp. n.

Pale ochraceous, coarsely and ferruginously punctate, but much less darkly and coarsely on corium. Head with the margins of the central lobe castaneous, and with two waved longitudinal series of castaneous punctures on each lateral lobe; antennæ mutilated, basal joint outwardly castaneous, inwardly punctured with castaneous. Pronotum with the lateral margins, a central longitudinal fascia, and a submarginal abbreviated oblique fascia on each side, levigate, ochraceous; basal angles acutely produced and slightly directed backwardly. Scutellum with the anterior margin, a spot at each basal angle, a central abbreviated longitudinal fascia extending through about half its length, and the apex levigate, ochraceous. Corium with a fasciate, abbreviated, longitudinal series of dark punctures on outer area of disk. Membrane bronzy, its apex hyaline. Head beneath and sternum pale ochraceous; abdomen dark ochraceous; legs speckled with brown. Rostrum reaching fourth abdominal segment, its apex piceous. Abdomen profoundly sulcate for about three parts of its length.

Long. 18 millim.; exp. pronot. angl. 9 millim.

Hab. Australia, Adelaide River. (Type, Brit. Mus.)

This species has a strong superficial resemblance to *Omyta centrolineata*, Westw.

Genus PÆCILOMETIS.

Pæcilometis scutellatus, sp. n.

Purplish ochraceous, coarsely and darkly punctate. Head with the punctures arranged in longitudinal series; antennæ castaneous, third, fourth, and fifth joints piceous, bases of third and fifth joints reddish, basal half of fourth joint reddish ochraceous, basal joint palest. Pronotum with a central line and the lateral margins narrowly ochraceous. Scutellum more or less piceous, its apex and some small basal spots ochraceous. Corium with the veins and extreme lateral margin obscurely ochraceous; membrane black. Connexivum piceous, its extreme margin ochraceous. Head beneath and sternum as above, black between the anterior and intermediate coxæ. Abdomen ochraceous, shaded with castaneous, coarsely punctate, the apical and lateral margins broadly black, extreme lateral margins ochraceous; central sulcation deep and very pronounced. Rostrum ochraceous, its apex pitchy and reaching apex of third abdominal segment.

Antennæ with the second joint longest, third and fifth sub-

equal in length, fourth about as long or a little longer than first.

Long. 15 millim.

Hab. Australia: Western Province, Perth; Victoria, Darlington. Two specimens (Brit. Mus.).

Genus ACCARANA.

Accarana convergens.

Spudeus convergens, Walk. Cat. Het. i. p. 204. n. 8 (1867).

Genus DALPADA.

Dalpada oculata.

Cimex oculatus, Fabr. Syst. Ent. p. 703 (1775).

Dalpada nodifera, Walk. Cat. Het. i. p. 222. n. 15 (1867).

Dalpada indeterminata, Walk. loc. cit. p. 225. n. 19.

Dalpada viridula, sp. n.

Ochraceous, thickly and coarsely punctured with metallic green. Head with the central lobe a little longer than the lateral lobes; antennæ variable in hue, in one specimen castaneous, the extreme bases of the joints ochraceous, in another castaneous, with the whole of the first and second joints and the base of the third and fifth joints ochraceous; first and second joints subequal in length, fourth a little longer than third. Pronotum with the anterior and lateral margins and the posterior margin very narrowly levigate, ochraceous, the lateral angles slightly prominent, but neither nodulose nor spinous; anterior lateral margins obscurely crenulate. Scutellum with the basal margin and a central longitudinal fascia, irregularly raised, levigate and ochraceous, apex broadly pale ochraceous. Corium with the punctures brownish and less metallic green, the disk in places irregular, levigate and ochraceous. Membrane bronzy, its apex paler. Body beneath and legs ochraceous; a broad sublateral margin to head, sternum, and abdomen metallic green, which is coarsely punctate on head and sternum and wrinkled on abdomen. Rostrum just passing posterior coxæ; abdomen profoundly sulcate.

Long. 19-20 millim.; exp. pronot. angl. 9 millim.

Hab. Salomon Islands. Three specimens (Brit. Mus.).

Genus CÆNOMORPHA.

Cænomorpha tibialis.

Atelocera tibialis, Walk. Cat. Het. i. p. 215. n. 18 (1867).

Cænomorpha segregata, Bergr. Ann. Mag. Nat. Hist. [6] xii. p. 115 (1863).

Cœnomorpha crassa, sp. n.

Dull brownish ochraceous, thickly covered with piceous punctures. Head long, with six longitudinal series of dark punctures; antennæ with the first, second, and third joints dark castaneous, the third obscurely ochraceous at base, fourth and fifth joints piceous, broadly ochraceous at base; second and fourth and third and fifth joints subequal in length. Pronotum with the anterior lateral margins strongly and coarsely dentate, the posterior lateral angles subprominent. Membrane pale brownish, with the veins darker. Connexivum narrowly margined with ochraceous, the segmental angles brownish. Body beneath a little paler than above; a prominent black spot between the anterior and intermediate coxæ; rostrum with its apical joint piceous and reaching the fourth abdominal segment; legs castaneous; femora ochraceous beneath; tibiæ with an ochraceous annulation. Abdomen with the disk palest and profoundly sulcated to the apex of the fifth segment, its lateral margins ochraceous, spotted with piceous at the segmental incisures.

Long. 21-22 millim.; exp. pronot. angl. 11-12 millim.

Hab. East Africa; Nyasaland, Masuku Mts., 6000-7000 feet (*A. Whyte*). Three specimens (Brit. Mus.).

Genus CHIPATULA.

Chipatula capitata, sp. n.

Ochraceous, somewhat thickly and irregularly covered with dark castaneous punctures. Head with six longitudinal series of dark punctures, the lateral margins recurved, especially at apices of the lateral lobes, the frontal margin sinuate and with six obtuse teeth; antennæ castaneous, with the bases of the second, third, fourth, and fifth joints ochraceous, second and fourth and third and fifth joints subequal in length. Pronotum with the lateral margins finely and obtusely serrate and ochraceous, the lateral angles subprominent and with a central longitudinal levigate line, which extends about half across disk. Scutellum with a curved, elongate, levigate, ochraceous spot in each basal angle, the extreme apex also ochraceous. Connexivum ochraceous, with coarse brown punctures, its extreme lateral margins ochraceous, darkly maculate at incisures. Membrane pale brownish, with the veins darker. Body beneath as above, but somewhat paler; a prominent black spot between the anterior and the intermediate coxæ (in a second specimen this dark colour is

continued in a broad fascia half across the abdomen) ; tibiæ very prominently angulated with ochraceous.

Long. 19-22 millim. ; exp. pronot. angl. 10-11 millim.

Hab. East Africa, Nyasaland, Nyika Mts., 6000-7000 feet (*A. Whyte*: one specimen, Brit. Mus.). Mashonaland, Salisbury (*G. A. K. Marshall*: coll. Dist.).

The peculiar structure of the head renders the generic identification of this species a matter of some little difficulty. I have placed it in my genus *Chipatula*, though it is probable that a new genus will be ultimately proposed for its reception.

Genus SCIOCORIS.

Sciocoris indicus.

Sciocoris indicus, Dall. List Hem. i. p. 132. n. 3 (1851).

The type and sole specimen of this species in the British Museum is now in an imperfect condition, the head and thorax being mutilated. I possess, however, a perfect specimen from Malabar. The apex of the scutellum in my specimen is luteous.

Sciocoris? obscurus, Dall. List Hem. i. p. 135. n. 14.

Type not now to be found under name in the collection of the British Museum. Probably transferred by Walker without record.

MENEDEMUS.

* Allied to *Sciocoris*, but with the head a little longer and narrower, and with the lateral margins distinctly reflexed. Scutellum more attenuated posteriorly.

Menedemus, of which the type is the *Sciocoris vittatus*, Dall., besides differing from *Sciocoris* by the above detailed structural characters, possesses, according to present knowledge, a distinct and ornamental coloration of a generally fasciate character.

Menedemus vittatus.

Sciocoris vittatus, Dall. List Hem. i. p. 133. n. 5 (1851).

Hab. Africa? One specimen (Brit. Mus.).

Menedemus Lewisi, sp. n.

Ochraceous, thickly covered with blackish punctures. Head with the lateral margins (narrowly) and three discal lineate

fasciæ levigate, ochraceous. Pronotum with three discal, lineate, levigate, ochraceous fasciæ, the central one straight, the outer two oblique. Scutellum with a small spot near each basal angle and a central levigate longitudinal fascia, ochraceous; extreme basal angle subfoveate and piceous. Corium with the base of lateral margins ochraceous. Membrane piceous. Connexivum alternately ochraceous and piceous. Body beneath piceous; sternum with sublateral ochraceous lineate spots; lateral margins of abdomen broadly dark ochraceous, extreme margin spotted with pale ochraceous; legs pale brownish. Antennæ with the third, fourth, and fifth joints piceous.

First and third joints of antennæ shortest and subequal in length, fourth slightly longer than fifth.

Long. $5\frac{1}{2}$ millim.

Hab. Ceylon (*G. Lewis*); North Khasia Hills (*Chennell*).
Coll. Dist.

Menedemus hieroglyphicus, sp. n.

Brownish ochraceous, thickly and darkly punctate. Head with three discal levigate, lineate, ochraceous fasciæ, the central one straight, the others slightly curved. Pronotum with the lateral margins and five similar fasciæ, and between the two outermost a short basal fascia, ochraceous. Scutellum with an elongate spot near each basal angle, the lateral and apical margins, a central longitudinal fascia, and a transverse central sinuate fascia crossing disk levigate, ochraceous, extreme basal angles subfoveate and piceous. Corium narrowly ochraceous at base of lateral margin, a sublateral lineate ochraceous fascia, and with some testaceous discal markings. Membrane piceous. Connexivum alternately ochraceous and black. Body beneath piceous; sternum with a sublateral ochraceous levigate fascia on each side; abdomen with the posterior segmental margins, a central and two discal longitudinal fasciæ on each side, and a series of marginal spots ochraceous.

Antennæ dull dark brownish, first and third and fourth and fifth joints subequal in length.

Long. 7-8 millim.

Hab. Bombay (*Dr. Leith*). Coll. Dist.

Genus *PODODUS*.

Pododus ovulus.

Sciocoris ovulus, Dall List Hem i. p. 132. n. 4 (1851).

Genus MENESTHEUS.

Menestheus cuneatus, sp. n.

Brownish ochraceous, somewhat thickly, finely, and darkly punctate; anterior and lateral margins of the pronotum ochraceous, levigate, the first very narrow; scutellum with a small foveate spot in each basal angle and a small spot on apex black. Connexivum ochraceous. Body beneath as above, but slightly paler; apex of rostrum, a few small spots on sternum near coxæ, stigmatal spots to abdomen, and the eyes piceous. Membrane brassy.

Antennæ ochraceous, first and third joints subequal in length, remainder mutilated. Head elongate, triangular, lateral margins nearly straight, apex narrowly rounded. Pronotum with the lateral margins nearly obliquely straight, slightly reflexed and rounded at the lateral angles; rostrum reaching the posterior coxæ.

Long. 15 millim.

Hab. Australia, Peak Downs. Coll. Dist.

Differs from *M. nercivus*, Dall., by its much larger size, more elongate form, the longer and more acuminate head, &c.

Genus PARAMECOCORIS.

Paramecocoris pallidus.

Sciocoris pallidus, Dall. List Hem. i. p. 137. n. 18 (1851).

Genus ENNIUS.

Ennius morio.

Sciocoris morio, Dall. List Hem. i. p. 137. n. 20 (1851).

Genus ERACHTEUS.

Erachteus boris.

Sciocoris boris, Dall. List Hem. i. p. 138. n. 22 (1851).

Erachteus boris, Stål, Cefv. Vet.-Ak. Förh. 1862, p. 496.

The type was unlocalized, but the British Museum now possesses a second specimen received from British Central Africa. Bergroth in 1894 stated that he had received it from the Cameroons.

Erachteus castaneus, sp. n.

Body above and beneath, legs, antennæ, and rostrum dull

dark castaneous. Head with the anterior margin narrowly and obscurely ochraceous. Connexivum dull ochraceous, broadly spotted with piceous at the junction of the segments. Membrane bronzy brown, with some piceous shadings. Eyes testaceous. Above and beneath thickly and finely punctate. Antennæ with the second, third, and fourth joints subequal in length, fifth joint mutilated.

Long. 10 millim.

Hab. East Central Africa (*Scott Elliot*). One specimen (Brit. Mus.).

Shape and form of *E. lutulentus*, Stål, but with the head distinctly narrower.

Genus *ÆNARIA*.

Ænaria elongata.

Pentatoma elongata, Dall. List Hem. i. p. 246. n. 84 (1851).

Niphe elongata, Stål, En. Hem. v. p. 73. n. 2 (1876); Leth. & Sev.

Cat. Gén. Hémi. p. 114 (1893).

The type of Stål's genus *Ænaria* is the *Drinostia Lewisi*, Scott. The type of his genus *Niphe* I take to be *Pentatoma cephalus*, Dall. Stål divides his genus *Niphe* into two sections —(a) "*Jugis ante tylum leviter prominulis*," (aa) "*Jugis tyloque æque longis*." This course should also be applied to *Ænaria*, to which *Pent. elongata*, Dall., in my opinion clearly belongs. The species of *Ænaria* are thus understood by myself:—

- | | |
|---|---|
| a. Lateral lobes of the head longer than the central and meeting in front of same | <i>Lewisi</i> , Scott. |
| aa. Lobes of the head subequal in length, central lobe sometimes slightly prominent | <i>assimulans</i> , Dist.;
<i>elongata</i> , Dall. |

THOLOSANUS, gen. nov.

Head broad, the lateral margins sinuate and slightly reflexed, lateral lobes slightly longer than the central lobes and generally a little cleft between their apices, which are rounded. Antennæ with the second joint distinctly longer than the third. Pronotum slightly gibbous at base to about between the lateral angles, and then moderately deflected towards head, the lateral margins very slightly convex, with the extreme edges slightly laminate and reflected; lateral angles broadly, obtusely, convexly subprominent. Scutellum broad, at base, apex narrowed and convexly rounded. Corium with

the apical margin subtruncate, its inner half moderately rounded. Sternum centrally sulcated.

Allied to *Dictyotus*.

Tholosanus proximus.

Sciocoris proximus, Dall. List Hem. i. p. 134. n. 12 (1851)

Pentatoma laticeps, Walk. Cat. Hct. ii. p. 308. n. 146 (1867).

Hab. Australia. (Type, Brit. Mus.)

Tholosanus philippinensis.

Sciocoris philippinensis, Dall. List Hem. i. p. 134. n. 11 (1851).

Hab. Philippine Islands. (Type, Brit. Mus.)

Genus CEPHALOPLATYS.

Cephaloplatys Pertyi.

Cephaloplatys Pertyi, White, Trans. Ent. Soc. Lond. iii p. 90 (1842).

White's specimens, on which this species was founded, are unlocalized. The British Museum now possesses four other specimens from Adelaide River, Australia.

Cephaloplatys elongatus, sp. n.

Elongate, ochraceous, darkly punctate. Head with the margins of the lateral and central lobes very thickly and darkly punctate, lateral margins angularly and subacutely produced in front of eyes; antennæ very pale stramineous, apical halves of third and fourth joints and fifth joint (excluding base) piceous. Pronotum with the anterior lateral angles somewhat laminately produced in flat anteriorly rounded projections to about the latitude of upper margin of eyes, its lateral margins not serrated, the posterior angles obtusely subproduced, its disk ornamented with 10 or 12 levigate stramineous spots. Scutellum with three small basal stramineous levigate spots, an elongate linear black spot in each basal angle, a small cluster of dark punctures at about centre of lateral margins. Membrane greyish, with longitudinal veins. Connexivum spotted with piceous at the incisures. Body beneath and legs stramineous; abdomen with a sublateral piceous fascia; legs spotted with piceous.

Long. 7 millim.; exp. pronot. angl. 4 millim.

Hab. North-west Australia (*S. Heywood, Jun.*). One specimen (Brit. Mus.).

A species readily recognized by its elongate form and the levigate spots to the pronotum.

Genus *DICTYOTUS*.*Dictyotus*, Dallas, List Hem. i. p. 130 (1851).*Tarba*, Walk. Cat. Het. i. p. 230 (1867).*Dictyotus favillacea*.*Tarba favillacea*, Walk. Cat. Het. i. p. 237. n. 1 (1867).*Dictyotus Roei*.*Pentatoma Roei*, Westw. in Hope Cat. i. p. 42 (1887).*Pentatoma æqualis*, Walk. Cat. Het. ii. p. 310. n. 150 (1867); Leth. & Sev. Cat. Gén. Hém. p. 197 (1893).*Dictyotus similis*.*Dictyotus similis*, Dall. List Hem. i. p. 143. n. 10 (1851).*Pentatoma truncatula*, Walk. Cat. Het. i. p. 311. n. 151 (1867).*Dictyotus geniculatus*.*Dictyotus geniculatus*, Dall. List Hem. i. p. 142. n. 8 (1851).*Dictyotus lineatus*, Walk. Cat. Het. i. p. 181. n. 13 (1867).*Dictyotus discoideus*.*Dictyotus discoideus*, Dall. List Hem. i. p. 144. n. 11 (1851).

The type of this species is no longer to be found in the British Museum.

Dictyotus vilis.*Pentatoma vilis*, Walk. Cat. Het. ii. p. 309. n. 147 (1867).*Pentatoma tibialis*, Walk. loc. cit. n. 148.*Sciocoris polystictica*, White, MS.*Dictyotus polystictica*, Dallas, List Hem. i. p. 141. n. 5 (1851).*Dictyotus polysticticus*, Butl. Zool. Voy. 'Erebus' and 'Terror,' Ins. p. 26, tab. vii. fig. 5 (1874).

White's name is an MS. one only, which Dallas quoted. Butler was the first to actually describe the species correctly, but is antedated by Walker, who described it in a wrong position and under another name.

Dictyotus truncatellus.*Eysarcoris truncatellus*, Walk. Cat. Het. iii. p. 558 (1868).*Dictyotus ventralis*.*Mormidea ventralis*, Walk. Cat. Het. iii. p. 555 (1868).

GALGACUS, gen. nov.

General characters of *Dictyotus*, but differing from that genus by the much more elongate body; scutellum only about half the length of the abdomen, abruptly narrowed and angulated at apex; corium much shorter than in *Dictyotus*, with the apical margin almost straight; membrane large, the venation reticulate; connexivum broad and moderately directed upwards.

Galgacus macer.

Dictyotus macer, Walk. Cat. Het. i. p. 182. n. 14 (1867).

Hab. South Australia. One specimen (Brit. Mus.).

ARNISCUS, gen. nov.

Head about as long as the pronotum, the lateral lobes sub-laminate, a little longer than the central lobe, moderately sinuate on lateral margins, convexly rounded at apices; antennæ with the second joint a little longer than the third, second joint considerably passing the apex of head. Pronotum with the lateral angles broadly and convexly prominent, their apices obtuse, and slightly raised upwardly and forwardly. Scutellum more than half the length of the abdomen. Rostrum reaching the posterior coxæ; second and third joints subequal in length.

Arniscus humeralis.

Sciocoris humeralis, Dall. List Hem. i. p. 185. n. 13 (1851).

Hab. Australia. (Type, Brit. Mus.)

Genus NIPHE.

Niphe cephalus.

Pentatoma cephalus, Dall. List. Hem. i. p. 245. n. 32 (1851).

Pentatoma lateralis, Walk. Cat. Het. ii. p. 301 (1867).

Genus TROPICORYPHA.

Tropicorypha ventralis.

Pentatoma ventralis, Dall. List Hem. i. p. 243. n. 25 (1851).

Tropicorypha rufescens.

Agonoscelis? *rufescens*, Walk. Cat. Het. iii. p. 546 (1868).

Genus TOLUMNIA.

Tolumnia latipes.

Pentatoma latipes, Dall. List Hem. i. p. 238. n. 15 (1851).

Pentatoma trispila, Walk. Cat. Het. ii. p. 302. n. 120 (1867).

Var. *Pentatoma contingens*, Walk. loc. cit. n. 121.

Tolumnia basalis.

Pentatoma basalis, Dall. List Hem. i. p. 237. n. 12 (1851).

Var. *Pentatoma gutta*, Dall. loc. cit. p. 239. n. 16.

Pentatoma inobtrusa, Walk. Cat. Het. ii. p. 305. n. 133 (1867).

Genus PENTATOMA.

Pentatoma viridicata.

Hymenarcys viridicata, Walk. Cat. Het. ii. p. 283. n. 3 (1867).

Lioderma viridicata, Uhler, in Wheeler's Rep. p. 830, pl. xlii. fig. 11 (1876).

Genus CARPOCORIS.

Carpocoris pallidus.

Pentatoma pallida, Dall. List Hem. i. p. 234. n. 4 (1851).

Carpocoris fuscispinus (part.), Leth. & Sev. Cat. Gén. Hém. i. p. 121 (1893).

Carpocoris nigricornis (part.), Leth. & Sev. loc. cit. p. 122.

Carpocoris coreanus, sp. n.

Head, pronotum, scutellum, connexivum, body beneath, and legs ochraceous; corium rosaceous; head with the lateral margins, margins of central lobe, and eyes, pronotum with four anterior spots (the outermost elongate) and the apices of the posterior lateral angles, scutellum with four basal and two subbasal spots, spots to connexivum at the incisures, antennæ (excluding basal joint), small sternal spots at bases of coxæ, a spot near apex of posterior femora, and a series of small marginal spots, at incisures, to abdomen beneath, black. Tibiæ and tarsi pale testaceous. Membrane pale hyaline, with an ochraceous stripe on each side.

Long. 10–13 millim.; exp. pronot. angl. 6–8 millim.

Hab. Corea (*Radinowsky*). Brit. Mus.

Allied to *C. fuscispinus*, Bohem., but differing by the much more slender and acute pronotal angles, different colour, &c.

Genus DOLYCORIS.

Dolycoris baccarum.

Cimer baccarum, Linn. Syst. Nat. ii. p. 721 (1767).

Pentatoma inconcisa, Walk. Cat. Het. ii. p. 301. n. 119 (1867).

Genus MORMIDEA.

Mormidea punctifer.

Eysarcoris punctifer, Walk. Cat. Het. ii. p. 274. n. 13 (1867).

Genus GALEDANTA.

Galedanta truncata, sp. n.

Galedanta myops, Dall. (nec Fabr.) List Hem. i. p. 199 (1851).

Galedanta bituberculata, Dall. (nec Am. & Serv.) *loc. cit.*

Body and legs ochraceous, thickly and darkly punctate; pronotum with two anterior black discal spots; a raised black shining tubercular spot in each basal angle of the scutellum. Antennæ with the first and second joints pale ochraceous, speckled with blackish; third joint piceous, with its base narrowly ochraceous; remaining joints mutilated. Pronotum with the lateral margins strongly serrate, the lateral angles produced into spatulate processes, somewhat directed upwardly, their apices truncate, rounded anteriorly, bluntly toothed posteriorly.

Long. 15–18 millim.; exp. pronot. angl. 11–13 millim.

Hab. Brazil. Four specimens (Brit. Mus.).

At once separable from the other two species of the genus, *G. myops*, Fabr., and *G. bituberculata*, A. & S., by the broad and apically truncate produced lateral angles of the pronotum *.

Genus EUSCHISTUS.

Euschistus basalis.

Mormidea basalis, Walk. Cat. Het. ii. p. 257. n. 28 (1867).

Euschistus brevis.

Mormidea brevis, Walk. Cat. Het. ii. p. 256 n. 26 (1867).

Euschistus crenator.

Cimex crenator, Fabr. Ent. Syst. iv. p. 101 (1794).

Euschistus conferrimus, Walk. Cat. Het. ii. p. 248. n. 38 (1867).

Mormidea melanocantha, Walk. *loc. cit.* iii. p. 552 (1868).

Euschistus bifidulus, Uhler (nec Pal. Beauv.), Proc. Zool. Soc. 1893, p. 705.

* The Museum now possesses the three species of the genus. *G. bituberculata* agrees better with Herrich-Schäffer's description of its synonym *Brochymena unicolor* than with its differential characters given by Stål in his "Hemiptera Fabriciana."

Euschistus? bovillus.

Euschistus bovillus, Dist. Bull. Soc. Ent. Belg. p. lxi (1887).

Mormidea bovilla, Bergr. Rev. d'Ent. x. p. 222 (1891).

Dr. Bergroth, who is in entomological criticism *nulli secundus*, writes that I have misplaced the genus by including it in *Euschistus*, of which, in his opinion, "il a le *facies*, mais non les caractères." Had he proposed for the reception of this *cruz criticorum* a new genus, the suggestion would have been a happier one than the pronouncement of its being a species of *Mormidea*, and that course will probably have to be followed.

Genus ILERDA.

Ilerda punctata.

Pentatoma punctata, Pal. Beauv. Ins. p. 84, Hém. pl. vii. fig. 6 (1805).

Mormidea? unisignata, Walk. Cat. Het. ii. p. 261. n. 53 (1867).

Genus PROXYS.

Proxys albo-punctulatus.

Pentatoma albo-punctulata, Pal. Beauv. Ins. p. 130, Hém. pl. ix. fig. 8 (1805).

Proxys victor, Uhler (nec Fabr.), Proc. Zool. Soc. 1893, p. 705; *ibid.* 1894, p. 173.

The few specimens from the Antilles returned by Mr. Uhler to the British Museum are all *albo-punctulatus*, Pal. Beauv.

Genus TIBRACA.

Tibraca basalis.

Mormidea basalis, Walk. Cat. Het. iii. p. 553 (1868).

Apparently allied to *T. limbiventris*, Stål, but differing by the colour of the antennæ. This species of Walker has nothing to do with the other he described under the same name (Cat. Het. ii. p. 257, 1867), which I have placed in the genus *Euschistus*.

Genus ADRIA.

Adria parvula.

Pentatoma parvula, Dall. List Hem. i. p. 246. n. 35 (1851).

Pentatoma brevivittata, Walk. Cat. Het. ii. p. 312. n. 155 (1867).

Genus *ÆSCHROCORIS*.*Æschrocoris ceylonicus*, sp. n.

Head black, with coppery reflections; pronotum, scutellum, and corium ochraceous, sparingly and very coarsely darkly punctate. Pronotum with the dark punctures somewhat confluent on the anterior area, the posterior spines produced laterally, slightly curved backwardly, extreme apex finely acute, the apex and margins blackish. Scutellum with a somewhat large black foveate spot in each basal angle. Membrane pale brownish, with the venation black. Body beneath and legs dark ochraceous, sparingly and coarsely blackly punctate; head and pronotal angles beneath, central longitudinal area of abdomen, bases, apices, and a subcentral annulation to femora, bases and a central annulation to tibiae black.

Long. 6 millim.; exp. pronot. angl. 5 millim.

Hab. Ceylon (*Green*). (Type, Brit. Mus.)

A species to be distinguished by the peculiar lateral angles to the pronotum.

Genus *ÆLIOMORPHA*.*Æliomorpha divisa*.

Sciocoris divisus, Walk. Cat. Het. i. p. 175. n. 40 (1867).

The typical and only specimen of this species in the National Collection is in a bad condition, and appears to be somewhat similar to *Æ. simulans*, Stål.

Genus *SEPONTIA*.*Sepontia stigmatica*, sp. n.

Ochraceous, somewhat thickly and darkly punctate; head, a wide anterior collar to the pronotum (sometimes divided at the centre into two large transverse subquadrate spots), and a large triangular spot at the base of the scutellum bronzy black. Antennæ ochraceous, apical joints darkest (somewhat variable in this respect). Scutellum with a small ochraceous levigate spot on basal margin at each side of the dark triangular spot. Body beneath blackish; marginal spots at sternal segmental incisures, apex of abdomen and a narrow macular lateral abdominal margin, rostrum, and legs ochraceous.

Var.—Scutellar basal black spot continued by two narrow fasciæ to apex.

The pronotum is slightly transversely ridged between the posterior angles, which are subprominent; the corium is visible for a little more than half the length of the scutellum.

Long. 4-4½ millim.

Hab. Ceylon (*G. Lewis*). Coll. Dist.

Genus ASPAVIA.

Aspavia inficita.

Mormidea inficita, Walk. Cat. Het. ii. p. 200. n. 50 (1867).

Aspavia hastator.

Coreus hastator, Fabr. Ent. Syst. iv. p. 129. n. 8 (1794).

Mormidea? *ventralis*, Walk. Cat. Het. ii. p. 200. n. 51 (1867).

This is quite distinct, and not even congeneric with the species described by Walker (Cat. Het. iii. p. 555, 1868) from Australia under the same name, and which belongs to the genus *Dictyotus*.

Genus CARBULA.

Carbula lateralis.

Mormidea lateralis, Walk. Cat. Het. ii. p. 263. n. 61 (1867).

Carbula socia.

Mormidea socia, Walk. Cat. Het. ii. p. 202. n. 60 (1867).

Mormidea similis, Kirby, Journ. Linn. Soc., Zool. xxiv. p. 82 (1892).

Mr. Kirby described a fresh specimen; Walker's type is founded on a faded example.

Carbula contigua.

Mormidea contigua, Walk. Cat. Het. ii. p. 204. n. 63 (1867).

Carbula crassiventris.

Pentatoma crassiventris, Dall. Trans. Ent. Soc. Lond. v. p. 189 (1849).

The type is from Boutan. The British Museum also possesses specimens from the island of Loo-Chow.

Genus GYENICA.

Gyenica rustica, sp. n.

Dark ochraceous brown; pronotum with the lateral spines

black; lateral margins and a broad fascia between the lateral spines (which is centrally deflected to the anterior margin) ochraceous. Scutellum with the lateral margins and apex broadly ochraceous. Antennæ with the basal joint ochraceous, second and third joints coral-red, fourth joint piceous, with the base reddish; apical joint mutilated. Body beneath ochraceous; legs brownish ochraceous.

The pronotum and scutellum are coarsely punctate, the punctures on the ochraceous fasciæ and margins being scarcer and deeper; the pronotal angles are broad, with their extreme apices acutely spinous, directed outwardly and somewhat upwardly, but not forwardly. The second and third joints of the antennæ are subequal in length.

Long. $10\frac{1}{2}$ millim.; exp. pronot. angl. 6 millim.

Hab. Transvaal. One specimen (Brit. Mus.).

Distinguished from *G. marginella*, Dall., and *G. affinis*, Dist., by the shape and direction of the pronotal spines &c.

Genus CHLOROCORIS.

Chlorocoris rufispinus.

Chlorocoris rufispinus, Dall. List Hem. i. p. 167. n. 2 (1851)

Chlorocoris rufidens, Walk. Cat. Het. iii. p. 543 (1868).

Genus LOXA.

Loxa flavicollis.

Cimex flavicollis, Dru. Ill. ii. p. 67, pl. xxxvi. fig. 4 (1773).

Loxa deducta, Walk. Cat. Het. ii. p. 242. n. 8 (1807).

Loxa affinis.

Loxa affinis, Dall. List Hem. i. p. 108 (1851).

Loxa invaria, Walk. Cat. Het. ii. p. 242. n. 7 (1807).

Genus FECELIA.

Fecelia nigridens.

Loxa nigridens, Walk. Cat. Het. ii. p. 241. n. 3 (1807).

Genus AGONOSCELIS.

Agonoscelis rutila.

Cimex rutilus, Fabr. Syst. Ent. p. 714 (1775).

Strachia tetragona, Walk. Cat. Het. ii. p. 332. n. 71 (1807).

Var. *Strachia aspersa*, Walk. loc. cit. p. 333. n. 72.

Genus EURYDEMA.

*Eurydema pulchra.**Pentatoma pulchra*, Westw. in Hope Cat. i. p. 34 (1837).*Strachia designata*, Walk. Cat. Het. ii. p. 327 (1867).*Eurydema rugosa.**Eurydema rugosa*, Motsch. Etud. x. p. 29 (1861).*Strachia signata*, Walk. Cat. Het. ii. p. 328 n. 60 (1867).*Strachia marginifera*, Walk. loc. cit. n. 61.*Eurydema dominula.**Cimer dominulus*, Scop. Ent. Carn. p. 124 (1763).*Strachia minuscula*, Walk. Cat. Het. ii. p. 348 n. 98 (1867).

Genus STENOZYGUM.

*Stenozygum insignitum.**Strachia insignita*, Walk. Cat. Het. ii. p. 343. n. 88 (1867).*Strachia marginalis*, Walk. loc. cit. n. 89.*Strachia* ? *insignita*, Leth. & Sev. Cat. Gén. Hémi. p. 157 (1893).*Strachia rubescens*, Voll. Versl. Ak. Amst. Nat. (2) ii. p. 186 (1898).

Genus STRACHIA.

*Strachia crucigera.**Strachia cruciger*, Hahn, Wanz. i. p. 184, fig. 95 (1831).Var. *Strachia strangulata*, Walk. Cat. Het. ii. p. 344. n. 90 (1867).*Stenozygum strangulatum*, Leth. & Sev. Cat. Gén. Hémi. i. p. 156 (1893).

Correction.

In a previous paper (*ante*, p. 223) I proposed the name *Drupadia* for a new genus. In this course I was misled by a printer's error in the 'Zoological Record' for 1884, which has given in the index *Drapadia* for *Drupadia*, Moore, a genus of Lepidoptera. Of course even then the two names would have been too near; but in searching for the one I totally overlooked the other. I now propose to substitute for *Drupadia* the name *Nishadana*.

Summarized Disposition of Walker's Genera and Species *.**Discocephalinæ and Pentatominæ (part.).***Genera considered valid.*

Brizica, Walk. Cat. Het. i. p. 236 (1867).

Genera treated as synonymic.

Turba, Walk. Cat. Het. i. p. 236 (1867), = Gen. *Dictyotus*, Dall.
Camara, Walk. loc. cit. p. 237, = Gen. *Tyoma*, Spin.
Bryelica, Walk. loc. cit. iii. p. 517 (1868), = Gen. *Empicoris*, Hahn.
Ansa, Walk. loc. cit. p. 548, = Gen. *Ogmocoris*, Mayr.
Udana, Walk. loc. cit. p. 549, = Gen. *Dalpada*, A. & S.

Species considered valid and described under correct Genera.

Pododus depressus, Walk. Cat. Het. i. p. 179. n. 4 (1867).
Discocephala deplanata, Walk. loc. cit. p. 185. n. 21.
 — *luteicornis*, Walk. loc. cit. n. 22.
 — *terminalis*, Walk. loc. cit. p. 186. n. 23.
 — *sordida*, Walk. loc. cit. p. 187. n. 24.
 — *notata*, Walk. loc. cit. n. 25.
Drytocephala (sic) *integra*, Walk. loc. cit. p. 190. n. 8 (*Dryptocephala*).
Cephaloplatus (sic) *spurcatus*, Walk. loc. cit. p. 191. n. 3 (*Cephaloplatys*).
 — *pallipes*, Walk. loc. cit. iii. p. 541 (1868) (*Cephaloplatys*).
Ochlerus terminalis, Walk. loc. cit. i. p. 195. n. 16 (1867).
Dinidor strigatus, Walk. loc. cit. iii. p. 542 (1868).
Aleceus lynicolor, Walk. loc. cit. i. p. 200. n. 3 (1867).
Spudeus latus, Walk. loc. cit. p. 201. n. 4.
 — *lignarius*, Walk. loc. cit. p. 202. n. 5.
 — *vagatus*, Walk. loc. cit. p. 203. n. 7.
Chlorocoris rubescens, Walk. loc. cit. iii. p. 543 (1868).
Agonoscelis femoralis, Walk. loc. cit. p. 545 (1868).
Dalpada liturifera, Walk. loc. cit. i. p. 220. n. 10 (1867).
 — *brevivitta*, Walk. loc. cit. p. 224. n. 18.
 — *cinotipes*, Walk. loc. cit. p. 229. n. 25.
Agachitus retipes, Walk. loc. cit. p. 234. n. 3.
Brizica alacris, Walk. loc. cit. p. 236. n. 1.

Species considered valid, but requiring generic revision.

Sciocoris divinus, Walk. Cat. Het. i. p. 175. n. 40 (1867), belongs to
 gen. *Æliomurpha*.
Dictyotus macer, Walk. loc. cit. p. 182. n. 14, belongs to gen. *Galgacus*, gen.
 [nov.]

* This summary only extends to the conclusion of Walker's first volume of his 'Catalogue of Hemiptera Heteroptera,' excluding the Asopinae (which are now generally regarded as more naturally following the Pentatominae) and the corresponding genera in the supplemental portion of his third volume. The synonymical references extend further and will appear in a future summary.

<i>Discocephala ampla</i> , Walk. loc. cit. p. 187,	belongs to gen. <i>Dinocoris</i> .
<i>Ochlerus discolor</i> , Walk. loc. cit. p. 194. n. 15,	" <i>Brachystethus</i> .
— <i>scaber</i> , Walk. loc. cit. p. 195. n. 17,	" <i>Hemingius</i> ,
	[gen. nov.
<i>Coriplatus sciocorinus</i> , Walk. loc. cit. p. 197. n. 3,	" <i>Braunus</i> , gen.
	[nov.
<i>Spudæus convergens</i> , Walk. loc. cit. p. 204. n. 8,	" <i>Accarana</i> .
<i>Pæcilometis conspersus</i> , Walk. loc. cit. p. 209. n. 13,	" <i>Eumecopus</i> .
— <i>minulus</i> , Walk. loc. cit. iii. p. 545 (1868),	" <i>Eumecopus</i> .
<i>Atelocera bipustulata</i> , Walk. loc. cit. i. p. 214. n. 17	
(1867),	" <i>Scribonia</i> .
— <i>tibialis</i> , Walk. loc. cit. p. 215. n. 18,	" <i>Cænomorpha</i> .
— <i>viridescens</i> , Walk. loc. cit. p. 215. n. 19,	" <i>Halyomorpha</i> .
<i>Agonoscelis rufescens</i> , Walk. loc. cit. iii. p. 546 (1868),	" <i>Tropocorypha</i> .
<i>Dalpada tecta</i> , Walk. loc. cit. i. p. 224. n. 17 (1867),	" <i>Nevisanus</i> .
<i>Tarba favillacea</i> , Walk. loc. cit. p. 237. n. 1,	" <i>Dictyotus</i> .
<i>Bryelica ramosa</i> , Walk. loc. cit. iii. p. 547 (1868),	" <i>Emyricoris</i> .
<i>Udana smaragdina</i> , Walk. loc. cit. p. 549,	" <i>Dalpada</i> .

Species treated as synonymic.

<i>Sciocoris clausus</i> , Walk. Cat. Het. i. p. 175. n. 41 (1867),	= <i>Cocalus leucogrammus</i> , Germ.
<i>Pododus</i> ? <i>æqualis</i> , Walk. loc. cit. p. 179. n. 3,	= <i>Pododus orbicularis</i> , Burm.
<i>Dictyotus lineatus</i> , Walk. loc. cit. p. 181. n. 13,	= <i>Dictyotus gemiculatus</i> , Dall.
<i>Discocephala inobtrusa</i> , Walk. loc. cit. p. 188. n. 3,	= <i>Discocephala clypeata</i> , Stål.
— <i>signata</i> , Walk. loc. cit. p. 188. n. 27,	= <i>Dinocoris guttatopunctata</i> , Fabr.
<i>Ochlerus guttipes</i> , Walk. loc. cit. p. 193. n. 8,	= <i>Macropygium reticulare</i> , Fabr.
— <i>vilis</i> , Walk. loc. cit. p. 196. n. 18,	= <i>Lincus rufospilotus</i> , Westw.
<i>Chlorocoris rufidens</i> , Walk. loc. cit. iii. p. 543 (1868),	= <i>Chlorocoris rufispinus</i> , Dall.
— <i>rufopictus</i> , Walk. loc. cit. p. 544,	= <i>Chlorocoris rubescens</i> , Walk.
<i>Spudæus viridescens</i> , Walk. loc. cit. i. p. 203. n. 6 (1867)	= <i>Coccoteris Winthemi</i> , Guér.
— <i>vitticeps</i> , Walk. loc. cit. p. 205. n. 9,	= <i>Polycarnes punctatissimus</i> , Montr.
<i>Pæcilometis ruficornis</i> , Walk. loc. cit. p. 208. n. 11,	= <i>Eumecopus armatus</i> , Fabr.
— <i>calidus</i> , Walk. loc. cit. n. 12,	= <i>Eumecopus armatus</i> , Fabr.
— <i>cognatus</i> , Walk. loc. cit. p. 210. n. 14,	= <i>Eumecopus australasiæ</i> , Dru.
— <i>plenus</i> , Walk. loc. cit. p. 211. n. 16,	= <i>Theseus modestus</i> , Stål.
<i>Dalpada collocata</i> , Walk. loc. cit. p. 221. n. 13,	= <i>Halyomorpha picus</i> , Fabr.
— <i>apicifera</i> , Walk. loc. cit. p. 222. n. 14,	= <i>Dalpada varia</i> , Dall.
— <i>nodifera</i> , Walk. loc. cit. n. 15,	= <i>Dalpada oculata</i> , Fabr.
— <i>bulbifera</i> , Walk. loc. cit. n. 16,	= <i>Dalpada clavata</i> , Fabr.
— <i>indeterminata</i> , Walk. loc. cit. p. 225. n. 19,	= <i>Dalpada oculata</i> , Fabr.
— <i>consobrina</i> , Walk. loc. cit. n. 20,	= <i>Dalpada clavata</i> , Fabr.
— <i>brevis</i> , Walk. loc. cit. p. 226. n. 21,	= <i>Halyomorpha picus</i> , Fabr.
— <i>remota</i> , Walk. loc. cit. p. 227. n. 22,	= <i>Halyomorpha picus</i> , Fabr.
— <i>proxima</i> , Walk. loc. cit. p. 23,	= <i>Halyomorpha picus</i> , Fabr.
— <i>japonica</i> , Walk. loc. cit. p. 228. n. 24,	= <i>Ertheina fulio</i> , Thunb.
<i>Brochymena tenebrosa</i> , Walk. loc. cit. p. 231. n. 7,	= <i>Brochymena obscura</i> , H.-S.

Amara limosa, Walk. loc. cit. p. 237. n. 1, = *Tyonia cryptorhyncha*, Germ.
Ansa distincta, Walk. loc. cit. iii. p. 548 (1868), = *Ogmocorus hypomelas*,
 Burm.

To be treated as non-existent.

Types mutilated.

Sciocoris deficiens, Walk. Cat. Het. i. p. 173 n. 22 (1867).

Discocephala transversa, Walk. loc. cit. p. 188 n. 28 (a species of the gen.
Eurystethus)

Discocephala longula, Walk. loc. cit. p. 189 n. 20 (apparently belonging
 to gen. *Menidia*).

Species the types of which are supposed to be in Australia.

Sciocoris lugubris, Walk. Cat. Het. iii. p. 538 (1868). National Museum,
 Melbourne

— *indicator*, Walk. loc. cit. p. 539 National Museum, Melbourne.

Pædometis alienus, Walk. loc. cit. i. p. 210 n. 15 (1867). National Mu-
 seum, Melbourne

L.—A Contribution to the History of the Carboniferous
Gancid, *Benedenius deneensis*, Traquair, with Notes on
 Two newly-discovered Specimens. By G. A. BOULENGER,
 F.R.S.

[Plates IX. & X.]

THANKS to the kindness of my friend the Rev. Dom Grégoire
 Fournier, O.S.B., I am able to make some additions to our
 knowledge of an imperfectly characterized Lower Carbon-
 iferous Fish allied to *Eurynotus*, previously known from two
 specimens only—the original, preserved in the University
 Museum of Louvain, first described as a *Palæoniscus* by the
 late Prof. Van Beneden and later as the type of a distinct
 genus, *Benedenius deneensis*, by Prof. Traquair; the second,
 preserved in the University Museum of Liège, described as
Benedenius Soreili by Prof. Fraipont.

These specimens were obtained from the black marble
 quarries of Denée, Prov. Namur, Belgium. The same quarries
 have lately yielded two further specimens of the fish, which
 are deposited, under the care of Father Fournier, in the
 beautiful abbey of Maredsous, near Denée, where I had an
 opportunity of seeing them on a recent visit. Having been
 so fortunate as to obtain the loan of these valuable fossils,
 I propose to give an account of them, and thus to supplement

on some points the excellent descriptions given by Profs. Traquair and Fraipont.

The most complete of the two specimens before me, which I will designate as A, is well preserved, so far as the body and fins are concerned, in slab and counter-slab; but the head shows only roughly the general outline, so that nothing can be added to our previous very scanty knowledge of the skull.

The second specimen, B, of about the same size and also exposed in two slabs, is much dislocated; but this is all the better, as it enables us to view the inner aspect of the scales, which was still unknown, and it shows remarkably well the pectoral girdle. It also affords the first direct evidence of the absence of ossifications round the notochord.

It is difficult to conceive anything poorer, considering the date of its publication, than Van Beneden's description and figure in Bull. Acad. Belg. (2) xxxi. 1871, p. 512, pl. iv., and, from the imperfection of the fossil on which it is based, one cannot account for the remark, "On ne pourrait avoir un poisson frais dans un plus bel état de conservation." The fish was referred to a genus the characters of which are very different, and named "*Palæoniscus de Denée*." Neither in the original description nor in the later published list of the fossil fishes of Belgium ("*Patria Belgica*," i. [1873] p. 387) was the name latinized, as stated by mistake in the British Museum '*Catalogue of Fossil Fishes*' (ii. p. 451). Therefore, according to the current rules of nomenclature, the species must bear as author's name that of Traquair, who described and figured it in 1878 (*De Koninck's Faune Calc. Carb. Belg.* i. p. 16, pl. ii.) as *Benedenius deneensis*, and again in his Monograph of the Platysomidæ (*Tr. R. Soc. Edinb.* xxix. 1879, p. 354, pl. iii. fig. 17), correctly referring it to a new genus in the immediate vicinity of *Eurynotus*. Yielding to the suggestion of a reviewer in these '*Annals*' for 1880, that the name *Benedenius* is preoccupied by the earlier *Benedenia*, Gray, Traquair himself in 1890 (*Ann. & Mag. Nat. Hist.* [6] vi. p. 492) changed it to *Benedenichthys*, a change which, in my opinion, was unwarranted.

The fish under consideration should therefore be called *Benedenius deneensis*, Traquair.

A supposed second species of the same genus, *Benedenius Soreli*, was described and figured by Fraipont in 1890 (*Ann. Soc. Géol. Belg.* xvii. p. 211, pl. v.) in a paper to which my attention has kindly been drawn by my friend Mr. Smith Woodward. I must regard it as a synonym, the only distinctive character of some importance residing in the shorter tail,

which may be due to its extremity being imbedded in the matrix.

On the evidence of the material now available it appears that the depth of the body is contained 2 to $2\frac{2}{3}$ in the total length (without caudal fin), the length of the head 4 to $4\frac{1}{2}$. The caudal peduncle is much deeper than long and the length of the caudal fin is contained about 4 times in the total.

The following measurements are taken from specimen A:—

	millim
Total length	290
Length of head	48
From head to caudal fin	170
Caudal fin (end imperfect)	76
Greatest depth of body	100
Length of caudal peduncle	22
Depth of caudal peduncle	31
From head to dorsal fin (in a straight line)	102
From head to ventral fin	79
From head to anal fin	125
Length of dorsal fin	58
Greatest depth of dorsal fin	40
Length of anal fin	25
Greatest depth of anal fin	40
Length of pectoral fin	46

The dorsal fin, high and pointed in front, low behind, formed of 54 slender, distally bifurcating rays, originates just behind the vertical of the base of the ventrals and twice as far from the base of the caudal as from the end of the snout. Van Beneden says, "S'il y a des écailles sur le bord antérieur, elles doivent être extrêmement petites." Traquair, notwithstanding the imperfect condition of the fossil, recognized the presence of fulcra, but could not have given a quite exact representation of them, nor are they correctly shown in Fraipont's figure. There is a series of well-developed fulcra along the anterior border of the fin, as much developed as in *Eurymotus*, and these fulcra are a prolongation of the enlarged dorsal scales or ridge-scales, which extend both in front and behind the dorsal, not to midway between the fin and the head, but right to the occiput. The posterior half of the base of the dorsal fin happens to be denuded of scales in specimen A, and shows well the distal endoskeletal fin-supports (baseoste) as short stout bones, somewhat hourglass-shaped, one to every three rays.

Fraipont represents the dorsal fin as short, formed of 25 rays and ending above the origin of the anal. This condition

is due, I think, to injury of the specimen and not to a specific difference, the "déchirure du bord dorsal du tronc en arrière de cette nageoire," to which the author alludes, and which is shown in the figure, accounting for the absence of the posterior half of the fin.

The anal fin is triangular, much deeper than long, and fulcrate like the dorsal; its base measures nearly half that of the dorsal. I count about 20 rays.

The pectoral fin has been described by Van Beneden as "comparativement peu développée, arrondie et non pas anguleuse"; and Traquair believed it to have been small, recognizing, however, its imperfect preservation. It is, on the contrary, long, longer than as restored by Fraipont, who made a much better guess at its real shape, nearly as long as the head, falciform, very similar to and but little smaller than that of *Eurynotus*. Its base is covered by 4 scales, the outer of which is much elongate and continued as a series of fulcra along the edge of the fin. The whole pectoral arch is well seen in specimen B, from which fig. 1, Pl. X., is taken. The post-clavicle overlapped the outer surface of the clavicle; the same is the case in Chondrosteous Ganoids and Clupeidæ alone among recent fishes, the post-clavicle being almost universally applied to the inner surface of the clavicle.

The ventral fin has a rather elongate base and, I think, 13 rays.

The caudal fin has been incorrectly represented in the type specimen owing to its imperfection. This accounts for Van Beneden's curious statement: "Le lobe inférieur ne paraît être qu'une seconde nageoire anale." For, as in the specimen studied by Fraipont, the rays really extend along the lower border of the prolonged axis, clad with small lozenge-shaped scales, almost to its extremity, as in *Palæoniscus*, *Eurynotus*, and allied forms. The large ridge-scutes which reappear behind the dorsal and anal fins are continued as a series of fulcra along the upper and lower lobes of the caudal fin; but it still remains undecided whether their arrangement was monostichous or distichous.

The scales, strongly imbricate and with the usual peg-and-socket articulation, number 63 in a longitudinal series and 35 in an oblique transverse series; they are, like the dorsal ridge-scutes, finely striated, a striation I would describe as produced by grooves rather than by raised ridges. The scales on the middle of the side are tetragonal, twice to twice and a half as deep as broad, considering only the exposed surface, obliquely striated, the striation being more distinct on the anterior half of the body than further back. As usual, the

scales become more equilateral towards the dorsal and ventral lines and towards the caudal extremity; close to the ridge-scutes they assume a more rounded shape and concentric striation. I am unable to detect a lateral line.

The inner surface of the scales is seen in specimen B (Pl. X. fig. 3) to be extremely similar to that of *Eurynotus*, viz. with a strong keel parallel with and near the anterior border, and a point at the upper end the length of which is about half that of the largest scales.

In specimen A, as it lies on the right side, the ventral scutes anterior to the ventral fins scarcely appear, being covered with small scales forming oblique series directed forwards; the two or three front ones, which are partially exposed, appear to be directed backwards, but this is probably due to crushing, what is seen on the outline of the pectoral region being the right branch of the V which is formed by these scutes. I must regard the arrangement described and figured by Van Beneden and Traquair as the natural one, and am therefore quite unable to account for the position these scutes assume in Fiaipont's specimen, which has led to the interpretation that they formed a single series, each scute being disposed transversely and perpendicular to the sides. On the contrary, these elements, as shown isolated in specimen B (Pl. X. fig. 4), were V-shaped pieces, as are known in many Ganoids, and formed of two distinct halves joined on the median line. Seen facing, they are thickest at the line of meeting of the branches of the V, which taper to a point.

As I have stated above, the dorsal ridge-scutes extend forwards to the occiput; 33 can be counted in front of the dorsal in specimen A, and 23 are preserved in regular succession in specimen B. Each of them corresponded to an interneural bone, which is to be detected in relief under the scales in specimen A.

The result of this examination entirely confirms Prof. Traquair's original conclusions, viz. that *Benedenius* is closely allied to *Eurynotus*, *Wardichthys*, and *Mesolepis*. Until we know something definite of the dentition, we may hold that the only fundamental difference between *Benedenius* and *Eurynotus* resides in the lesser elongation of the dorsal fin and the larger ridge-scutes in the former, characters shared by *Mesolepis* and the imperfectly known genus *Wardichthys*, allied fishes with very deep body. I cannot understand what could have induced Prof. Traquair to modify his views in 1890, as appears from a note in these 'Annals' (ser. 6, vol. vi. p. 492), to the effect that the author has "become convinced that, though it presents many resemblances to the *Platysomidae*,

it [*Benedenius*] is after all more Palæoniscid, and should be restored to the family Palæoniscidæ"; the result of which has been, as I think, an incorrect allocation of this genus in Mr. Smith Woodward's 'Catalogue of Fossil Fishes.'

At the suggestion of Dr. Traquair, who has most kindly assisted me with advice, I have compared the new specimens with the type in the Zoological Museum of Louvain University, which has been most kindly entrusted to me by Prof. Gilson. I entertain no doubt as to their specific identity, although the proportions differ a little, as may be seen from the following measurements of the type specimen:—

	millim.
Total length	205
Length of head	53
From head to caudal fin	158
Caudal fin	85
Greatest depth of body	108
Length of caudal peduncle	20
Depth of caudal peduncle	31
From head to dorsal fin (in a straight line)	104
From head to ventral fin	76
From head to anal fin	120
Length of dorsal fin	50
Greatest depth of dorsal fin	38
Length of anal fin	25

After the excellent description given by Traquair of that specimen, I have naturally little to add. I must, however, point out that the shape and sculpture of the scales approaching the dorsal ridge-scales have not been correctly figured; they entirely lose the rhomboidal shape and assume a more concentric striation, as I have described above. A piece of this region is figured, enlarged, on Pl. X. fig. 5. The base of the dorsal fin is denuded, but there remain a few of the distal hourglass-shaped fin-supports (baseosts), noticed above, and I can also distinguish the extremities of several of the proximal supports (axonosts), the presence of which had not yet been ascertained in *Benedenius*; these axonosts are nearly as thick as the baseosts.

EXPLANATION OF THE PLATES.

PLATE IX.

Benedenius deneensis, Traq., nearly complete specimen (A), preserved in the Abbey of Maredsous. The greater part of the head and the extremity of the tail omitted. Natural size.

PLATE X.

- Fig. 1.* Dislocated shoulder-girdle, from specimen (B) preserved at Maredsous. Natural size. *cl.*, clavicle; *i.cl.*, interclavicle; *p.*, pectoral fin; *p.cl.*, post-clavicle; *p.te.*, post-temporal; *s.cl.*, supra-clavicle.
- Fig. 2.* Restoration of shoulder-girdle. Same lettering.
- Fig. 3.* Inner view of scales, in middle of body, from specimen (B) preserved at Maredsous. $\times 2$.
- Fig. 4.* Ventral ridge-scutes, as seen in specimen B. Natural size.
- Fig. 5.* Dorsal scales, towards middle of body, from type specimen preserved in the Zoological Museum of the University of Louvain. $\times 2$.

LI.—*Descriptions of Three new Reptiles and a new Batrachian from Mount Kina Balu, North Borneo.* By G. A. BOULENGER, F.R.S.

AMONG some Reptiles and Batrachians collected in March 1899 on Mount Kina Balu by Dr. Hanitsch, of the Raffles Museum, Singapore, and submitted to me for identification, there are examples of several new species, which he has kindly permitted me to describe.

Gecko rhacophorus.

Head moderately large, once and one third as long as broad; snout longer than the distance between the eye and the ear-opening, once and a half the diameter of the orbit; ear-opening round, its diameter one third that of the eye. Body and limbs much depressed, bordered with dermal expansions; fingers and toes fully half-webbed. Head, body, and limbs covered with minute granules intermixed with small, round, smooth tubercles; rostral a little more than twice as broad as deep, without median cleft; nostril pierced between several small scales; nine upper and ten lower labials; symphyseal small, pentagonal; a series of six small chin-shields; spine-like tubercles on the sides of the head, the largest above the ear. A moderately developed scalloped membrane on each side of the body, scaled like the body and fringed on the edge. Abdominal scales flat juxtaposed granules. An angular series of præanal pores. Tail depressed, scaled like the body, bordered with a series of rounded lobes. Greyish above, speckled with darker and with wavy dark transverse lines; brownish beneath, throat with darker dots.

	millim.
Total length	106
Head	18
Width of head	14
Body	47
Fore limb	21
Hind limb	28
Tail	40

A single specimen from the Kadamaian River, Kina Balu, 2100 feet, preserved in the Raffles Museum.

This species connects *Gecko* with *Ptychozoon* and stands in the same relation to the latter genus as *Hemidactylus platyurus* does to *Mimetoazon*. The lesser development of the parachute-like lateral membrane and the absence of differentiation in the lepidosis of that membrane justify its allocation to the genus *Gecko* rather than to *Ptychozoon*.

Stoliczkaia borneensis.

Rostral moderately large, triangular, not visible from above; a pair of very narrow internasals; a pair of large præfrontals, separated from the frontal and supraoculars by a series of small scales; frontal a little broader than long, a little shorter than the parietals; supraocular very small; eye very prominent, with vertically subelliptic pupil, surrounded by the supraocular, two or three præoculars, the fifth labial, and 7 or 8 small scales; nostril very large; loreal much longer than deep; ten upper labials, the two last longest; temporals small, scale-like; a single pair of small chin-shields, in contact with three lower labials. Scales in 30 rows, those on the vertebral region and those adjacent to the ventral shields largest, elongate rhomboidal, juxtaposed, the others very small and separated by naked skin. Ventrals 210; anal entire; subcaudals 124. Rufous, with large blackish spots, at least as large as the space between them, disposed more or less regularly in three longitudinal series; brown beneath, the shields edged with yellowish.

Total length 750 millm.; tail 240.

A single female specimen from Mount Kina Balu, 4200 feet. Raffles Museum.

OREOCALAMUS, gen. nov.

Agrees in every respect with *Macrocalamus*, Gthr., except in the presence of a pair of internasal shields.

Oreocalamus Hanitschi.

Snout pointed. Rostral as deep as broad, the portion visible from above measuring half its distance from the frontal; internasals half as long as the præfrontals; frontal hexagonal, once and a half as long as broad, longer than its distance from the end of the snout, shorter than the parietals; nostril close to the rostral, between a nasal and the first labial (the suture between the two shields has disappeared on the left side of the type specimen); loreal longer than deep, its lower border forming an angle wedged in between the second and third labials; one præ- and one postocular; temporals 1+2; eight upper labials, fourth and fifth entering the eye, seventh largest; first lower labial in contact with its fellow behind the symphysial; four lower labials in contact with the anterior chin-shields; posterior chin-shields shorter, in contact with each other. Scales smooth, in 17 rows. Ventrals 127; anal entire; subcaudals 26 pairs. Blackish brown above and on the outer ends of the ventral shields; belly yellowish white, with a few scattered brown dots; tail brown beneath, with a darker median streak.

Total length 375 millim.; tail 50.

A single male specimen from Kina Balu, 4200 feet. Raffles Museum.

Leptobrachium baluense.

Tongue pyriform, entire. Vomerine teeth in two small widely separated groups behind the line of the choanæ. Head much depressed, nearly twice as broad as long, semi-circular in outline; skin adherent to the rugose skull; snout shorter than the diameter of the orbit, not projecting beyond the mouth; canthus rostralis angular; loreal region vertical, concave; interorbital region nearly twice as broad as the upper eyelid; tympanum feebly distinct, three fifths the diameter of the eye. Fingers rather elongate, slender, first extending a little beyond second. Foot much longer than the head; toes moderately long, slender, with a very short web at the base; no subarticular or metatarsal tubercles. The tibio-tarsal articulation reaches the shoulder. Skin perfectly smooth; a very small tubercle near the border of the upper eyelid, above the pupil. Back and upper surface of snout dark grey; posterior half of upper surface and sides of head blackish brown; a curved light streak, the concavity turned forwards, across the upper eyelids and the interorbital region, followed by a Y-shaped blackish marking; two light

spots on the upper lip, below the eye; large blackish-brown partly confluent spots on the back; sides dark brown, light-edged above; limbs dark brown, with rather indistinct darker cross-bars; throat brown, belly brownish white.

From snout to vent 65 millim.

A female specimen, full of ripe eggs 3 millim. in diameter, from Mount Kina Balu, 4200 feet.

Nearest allied to *L. Feæ*, Blgr. Distinguished by the smaller head, the distinct tympanum, the longer digits, and the absence of a large horn-like tubercle on the upper eyelid.

LI.—*Descriptions of new Reptiles and Batrachians collected by Mr. P. O. Simons in the Andes of Ecuador* By G. A. BOULENGER, F.R.S

Stenocercus Simonsii.

No pterygoid teeth. Anterior border of ear with three or four conical scales forming a strong denticulation. Middle supraocular scales broader than long; no enlarged occipital. Sides of neck irregularly folded; a transverse fold in front of the collar, which is narrowly interrupted in the middle. Body depressed; a slight dorsal denticulation or low vertebral crest. Nuchal, lateral, and anterior dorsal scales very small, granular, obtusely keeled; on the back the scales become gradually much larger, rhomboidal, subimbricate, obtusely keeled, not mucronate, merging into the caudals, the keels forming oblique lines converging posteriorly. Gular and ventral scales rhomboidal, imbricate, smooth, the ventrals as large as the dorsals. The hind limb, stretched forwards, reaches the ear or the eye, fifth toe not extending as far as second. Tail nearly twice as long as head and body, rounded, tapering; caudal scales large, strongly keeled, mucronate, spinose, arranged in rings. Grey-brown above, with five or six black cross-bars, which may be interrupted on the vertebral line, the first descending to the collar-fold; dark and light marblings on the side of the neck and between the dorsal bars; a light black-edged streak from below the eye to above the ear; limbs and tail with blackish cross-bars; lower parts whitish, with rather indistinct olive-grey spots on the chin and throat.

From snout to vent 70 millim.; head 19; width of head 12; fore limb 31; hind limb 49.

Two specimens from Oña, 6500 feet altitude.

Liocephalus rhodomelas.

Upper head-scales small, obtusely keeled; nasal separated from the rostral; no large supraoculars; parietals broken up. Sides of neck not plicate, covered with pointed, imbricate, keeled scales. A well-developed dorsal crest. Dorsal scales large, mucronate, strongly keeled, the keels forming straight longitudinal lines; laterals quite as large; ventrals a little smaller, smooth; 45 scales round the middle of the body. Gular scales nearly as large as dorsals. The hind limb, stretched forwards, reaches the ear or the eye. Tail feebly compressed, crested at the base only. Pale brown above, with black chevron-shaped markings, pointing backwards, across the back; sides with small black spots; a more or less marked black and white spot or ocellus above the fore limb; loreal and subocular region cream-colour, the edge of the mouth black; gular region cream-colour, streaked with blackish, with a median black patch followed by a pink one; a black bar across the pectoral region, confluent with a black stripe along the middle line of the belly, widening on the præanal region and continued under the hind limbs; sides of belly pink. These ventral markings absent in the young.

Total length 232 millim.; from snout to vent 87; head 20; width of head 14; fore limb 34; hind limb 56.

Four specimens from Ofia, 6500 feet.

I avail myself of this opportunity to observe that the lizard from Mr. Simons's collection recently described by me as *Ameiva leucostigma* (P. Z. S. 1899, p. 517, pl. xxviii.) is a *Cnemidophorus*, and is identical with *C. lentiginosus*, Garm. (Bull. Essex Inst. xxiv. 1892, p. 92), as pointed out to me by my friend Count Peracca.

Prostherapis tricolor.

Snout depressed, projecting, squarely truncate, as long as the eye, with angular canthus rostralis and vertical loreal region; nostril nearer the end of the snout than the eye; interorbital space broader than the upper eyelid; tympanum perfectly distinct, its greatest diameter two thirds that of the eye. First finger not extending beyond second; toes free; terminal disks and subarticular tubercles of fingers and toes rather small; two small metatarsal tubercles. The tibio-tarsal articulation reaches the eye when the hind limb is stretched forwards. Skin smooth. Lemon-yellow; a black lateral band, from the end of the snout to the groin, passing through the eye and the tympanum; another more or less

broad black band along each side of the back, confluent or not with a black spot on the upper eyelid; mouth with a narrow black edge; belly and limbs marbled with black or with a wide-meshed black network; base of arm, lumbar region, and lower surface of tibia vermilion-red; back of thighs vermilion above, black beneath.

From snout to vent 20 millim.

Four specimens from Porvenir, Bolivar, western slope, about 5800 feet.

Phyllodromus vertebralis.

Snout rounded, feebly projecting; canthus rostralis obtuse; loreal region very slightly oblique; nostril nearer the tip of the snout than the eye; interorbital space a little broader than the upper eyelid; tympanum rather indistinct, its diameter a little more than half that of the eye. Fingers and toes rather short, with small disks and feeble subarticular tubercles; first finger not extending beyond second; toes free; two feebly prominent rounded metatarsal tubercles and an oblique curved fold from the inner metatarsal tubercle to the middle of the tarsus. The tibio-tarsal articulation reaches the shoulder or the tympanum. Skin smooth. Grey above, with or without darker spots; a dark lateral band, edged above with whitish, from the end of the snout to the groin, passing through the eye and over the tympanum; a fine whitish vertebral line; hinder side of thighs mottled with brown; upper lip and lower parts white. Male with an internal vocal sac.

From snout to vent 20 millim.

Several specimens from Cañar, 8400 feet altitude.

Hylodes crucifer.

Tongue oval, entire. Vomerine teeth in two small oblique oval groups behind the level of the choanæ. Head as long as broad; snout pointed, projecting; canthus rostralis distinct, curved; loreal region concave; interorbital space a little narrower than the upper eyelid; tympanum distinct, two fifths the diameter of the eye. Fingers and toes moderate, with large transversely oval disks and feeble subarticular tubercles; first finger not extending as far as second; toes free. The tibio-tarsal articulation reaches the tip of the snout. Skin with scattered large prominent warts, disposed symmetrically, the most conspicuous of which are subconical and situated on the upper eyelid, below the tympanum, and

at the tibio-tarsal articulation; belly areolate. Pale brownish above, with a large cross-shaped (†) marking from between the eyes to the sacral region; a dark canthal streak; upper lip with vertical dark bars; limbs with very sharply defined oblique dark brown cross-bars; lower parts brownish, much marbled with dark brown.

From snout to vent 19 millim.

A single specimen from Porvenir, Bolivar, 5800 feet.

LIII.—*New Species of Cladophyllia, Prionastræa, and Styliina.* By J. W. GREGORY, D.Sc., F.G.S.

1. *Cladophyllia Birleyæ*, sp. n.
(From the Atherfield Clay.)

A few years ago Miss Birley lent me a coral which had been collected by herself and Miss Copeland from the Atherfield Clay of the Isle of Wight. A section was cut, but showed no trace of internal structure; and Miss Birley kindly allowed me to retain the specimen until a more convenient time. Some further sections have recently been prepared, and they fortunately show the structure and affinities of the coral.

Diagnosis.—Corallum a large crowded hemispherical tuft. The branches are cylindrical, fairly thick, and sinuous; they dichotomize repeatedly. Calices circular, shallow.

Septa coarsely dentate, and some appear to be slightly cribriform. The septa occur in four complete cycles. One septum is continued across the centre of the corallite, where it expands; in some corallites trabeculae from other septa unite with this larger septum, giving the appearance of a parietal columella. Dissepiments scanty.

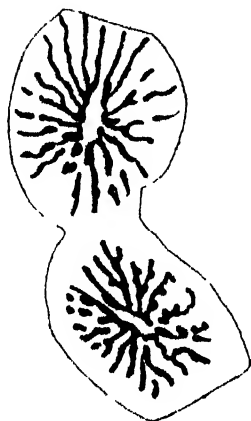
Dimensions.—

Diameter of corallum	. . .	75 by 85 mm.
Height	" "	50 mm.
Diameter of corallite	. . .	3-5 "
" "	calice . . .	2 "
Depth	" "	1 "
Number of septa	. . .	Up to 48

Distribution.—Atherfield Clay, Atherfield, Isle of Wight. Coll. Miss Birley.

Affinities.—This species is most nearly allied to *Cladophyllia crassilamella*, From.*, from the Neocomian of Morancourt. From that form it differs by having more numerous

Fig. 1.

Transverse section across two corallites. $\times 6$ diam.

septa, and especially by the coarse dentation of the septa. The strong "columellar septum" is similar to that of *Pleurosmilia*.

2. *Prionastraea Vaughani*, sp. n.
(From the Eocene of Alabama.)

Diagnosis.—Corallum subarborescent, in simple cylindrical branches. Walls thin. Calices deep, elliptical in shape. Rims distinct, separated by shallow grooves. Corallites mostly pentagonal; occasionally quadrangular or hexagonal.

Septa about five orders, of which two or three unite with the large columella. The septa are dentate; on the upper margin and laterally they are covered by short sharp spines.

Dimensions.—

Diameter of branch	. . . . .	17 mm.
" corallite	. . . . .	4-5 "
" columella	. . . . .	1.5 "
Depth of the calice	. . . . .	2 "

* E. de Fromentel, Pal. franç. Terr. crét., Zooph. pt. 8, 1870, pl. xciii. fig. 1, pt. 9, 1873, p. 417.

Distribution.—Eocene, Huntsville, Alabama. Coll. Brit. Mus., R. 4146.

Fig. 2 a.



Fig. 2 b.

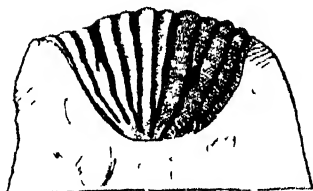


Fig. 2 a.—Part of the surface, showing one corallite undergoing fission.
× 6 diam.

Fig. 2 b.—A corallite from the side. × 6 diam.

Affinities.—My attention was called to this species by Mr. T. Wayland Vaughan, of the United States Geological Survey, who noticed it while examining the American Cainozoic corals in the British Museum. The coral was new to him, but he had not time to describe the species. The Museum records state that the specimen came from Alabama. Mr. Vaughan informs me that the precise locality is no doubt Huntsville. A section has recently been cut across the coral, which shows that it belongs to the genus *Prionastræa*, as the corallites are directly united by their walls. It therein differs from *Favia*, which it resembles by the occasional growth and fission.

Its nearest ally is probably *Prionastræa confertissima* (Rss.)*, from Castalgomberto, in which fission is more frequent and the calices less regular in shape.

* *Favia confertissima*, von Reuss, Anth. Castalg., Denk. Akad. Wiss. Wien, vol. xxviii. 1868, p. 152, pl. viii. fig. 5.

3. *Styliua Collinsi*, sp. n.
(From the Mexican Neocomian.)

Diagnosis.—Corallum massive; irregularly nodular; broad based; taller than thick.

Cœenchyma variable in width from a mere film to a band as wide as the corallites. The surface is either marked by the confluent costæ or it is smooth or granular between raised calicular margins.

Septa thin, in 2 or 3 cycles. The symmetry is octameral.

Columella stout, usually appearing as a well-raised knob.

Dimensions.—

Corallum 50 mm. thick by 60 mm. high by 90 mm. long.

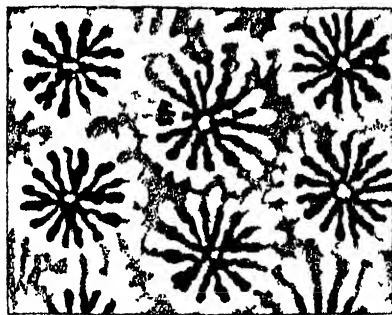
Diameter of corallites 1.5–2 mm.

Average distance of calicinal centres . . . 3–3.5 „

Distribution—Neocomian. From limestone half a mile from the quicksilver mine at La Trinidad, 4 miles from the town of Guadalcázar, State of San Luis Potosí, Mexico, alt. 6500 feet.

Collected by Mr. H. F. Collins, who has kindly presented half of the specimen to the British Museum (Nat. Hist.).

Fig 3.



Part of surface of the specimen with six calices. $\times 6$ diam.

Affinities.—This coral is a member of the octameral group of *Styliua*. Its nearest ally is *Styliua pachystyliua*, Koby *, from the Swiss Urgovian. In all probability the two corals are geographical varieties, but with the available material it is unsafe to identify them as the same species. The Mexican

* Koby, Mon. Polyp. crét. Suisse, pt. i. 1896, p. 26, pl. v. fig. 6.

coral differs by having narrower intercalicular areas and much stouter costæ and frequently a raised calicular rim. Dr. Felix * does not quote any coral under the name of *Stylina* from the Neocomian of Puebla; but he describes a species as a *Cryptocænia*, which, however, is probably a *Cyathophora*.

LIV.—*Description of Conus* (*Cylinder*) *clytospira*, *sp. n.*, from the Arabian Sea. By JAMES COSMO MELVILL, M.A., F.L.S., and ROBERT STANDEN.

Conus (*Cylinder*) *clytospira* †, *sp. n.*

C. testa magna, elegantissime attenuato-cylindrica, lævi, parum nitida, alba, brunneo-, castaneo- vel ochraceo-reticulata et maculata, sicut in C. aulico vel C. episcopo, spira mire conspicua; anfractibus sedecim, pulchro gradatis, infra suturas excavatis, angulatis, deinde rectis, quorum novem supernis, sub lente spiralter sculptis, parvis, albidis, in medio angulatis, ad angulum minute albi-nodulosis, ultimo anfractu pergracili, attenuato, ad basin leniter producto, spiralter interrupte bi- vel trifasciato; apertura angusta, contracta, labro tenui, supra, apud suturam, late excavato; columella recta.

Long. 119, lat. 37 mm. (*sp. maj.*).

„ 108, „ 33 „ (*sp. min.*).

Hab. Arabian Sea, about 125 miles W.S.W. of Bombay, long. 71° 30' to 71° 45' E., lat. 18° 43' N., adhering to the submarine cable of the Eastern Telegraph Co., hauled up from 45 fathoms (*F. W. Townsend, Esq.*).

The dredging of this remarkable textile cone undeniably constitutes one of the most important discoveries of the kind during the nineteenth century. It will rank amongst the most select of a genus unusually distinguished in both form, texture, and coloration. In form, indeed, it is more gracefully attenuate than its nearest ally, *C. gloria-maris*, Chemn., but in the latter characteristic, viz. coloration and pattern of marking, it more assimilates *C. aulicus*, L., or *episcopus*, Hwass, being twice or thrice interruptedly spirally banded on the last whorl, with coarse, widely spread reticulations enclosing oblong, obtusely triangular, or trapezoid spaces of varying dimensions.

* J. Felix, "Verst. mexican. Jura- u. Kr.-Form.," *Palæontogr.* vol. xxxvii. 1891, p. 154, pl. xxiv. figs. 5, 5 a-b.

† κλύρος, illustrious, σπείρα, spire.

The spire, however, is the most distinguishing characteristic, measuring as it does 45 millim., or about $1\frac{7}{8}$ inch, longitudinally, in our largest example, and possessing sixteen whorls, the upper white, more angled, with minute white gemmuled nodules, the lower seven gradate, channelled and grooved, angled, and fairly straight. The spire of *C. gloria-maris*, Chemn., in the collection of one of us, is but twelve-whorled, not so conspicuously gradate, with no sign of the noded angle in the centre of the upper whorls. *C. pyramidalis*, Lam., seems the only other species with an elevated spire at all possessing similar characteristics, though smooth throughout.

In the "Notes on the Subgenus *Cylinder* of *Conus*, 1886-7"*, thirty-nine forms in all were enumerated by Melvill, to which one, besides the present shell under discussion, viz. *C. Prevostianus*, Sowb., has to be added. The *C. clytospira* seems to us to fall, despite the similarity in marking to *C. episcopus*, into the third section "*Pyramidalis*," of *Coni textiles veri*, in company with *C. gloria-maris*, Chemn., and *C. pyramidalis*, Lam., and also perhaps *C. legatus*, Lam.

It may be interesting here to quote some remarks of Mr. F.W. Townsend's on the subject under date September 14, 1899:—

"The cable of the Eastern Telegraph Company laid in 1870 required overhauling, and a new piece, about 13 miles in length, being substituted; and we [Indo-European Telegraph Co.] were asked to undertake this work for them. Of course we had to take up so much of the old cable as we could get. We recovered, I think, about ten miles of it, and an enormous quantity of shells came up with it. They were all dead, but several were in a very good state of preservation. They are for the most part cones, and came up quite imbedded in the outer covering of the cable, a coat of pitch compound on jute yarn. The only theory I can assume for there being so many of them is that in their living state they got caught by the pitch on coming across the cable, and were thus poisoned. This cable, I may state, had not been touched for nearly thirty years; it was laid on a coarse sandy bottom with occasional patches of rock, and, excepting where the rock occurred, came up almost as clean as the day it was laid. Depth, say, 45 fathoms.

"The large cone will, I hope, prove to be undescribed. I know nothing like it in form excepting *C. gloria-maris*, and

* Mem. Manch. Lit. & Phil. Soc. series iii. vol. x. p. 76.

it does not possess the fine reticulations of that species. When the old cable was being hove in many things dropped off, unfortunately, after leaving the water, and before they could be shipped on board, and many more were knocked off by the cheeks of the bow-sheaves; and I saw a most lovely specimen of this cone unfortunately so knocked off, I think about 2 inches longer * than the best of the couple I secured."—*F. W. T.*

We may add that the bulk of the Mollusca obtained at the same time consisted of *Coni* of four or five species, none of them of frequent occurrence. About one hundred *C. planiliratus*, Sowb., hitherto only dredged at two points on the Malabar coast; *C. acutangulus*, Brug., not uncommon; and two species, probably new, were present more rarely. A *Marginitella*, sp. n.; two undescribed *Pleurotomæ*; with *Drillia Tayloriana*, Reeve, *Rostellaria curta*, Sow., *Murex malabaricus*, Smith, and *Ficula reticulata*, Lam., also occurred. All were unfortunately more or less injured with the pitch, manganese, and ferruginous oxide of the cable, being indelibly stained. Others, again, were much riddled by worms; but a few remained in fairly good condition, and by their epidermis showed that they had been live shells when they came in contact with the cable.

Two examples of the *Conus clytospira*, as already remarked, occurred, both specimens agreeing save in coloration, one being paler than the other, with ochraceous markings.

It is hoped that shortly they will be placed in our National Collection, South Kensington, and, we may add, it is our intention to have them figured; but this will probably not be until the full account we contemplate writing of all the Molluscan collections of Mr. Townsend formed since 1893 in the Arabian Sea and Persian Gulf is published.

BIBLIOGRAPHICAL NOTICES.

The History of the European Fauna. By R. F. SCHARFF, B.Sc., Ph.D., Keeper of the Natural History Collections, Science and Art Museum, Dublin. Contemp. Sci Series. London: W. Scott, Ltd., 1899.

DR. SCHARFF'S association with the comprehensive study of our European fauna is so well recognized that the present volume comes as the realization of a desire by his friends and sympathizers that he would give us his views in a more extended and popular form than they have hitherto assumed. This he has now done;

* This specimen would therefore have been 7 inches long

and since his arguments, contained in papers which form the basis of the work before us, have so recently been under discussion, it is unnecessary here to deal with them in detail. Suffice it to remark that he sets out with a desire to explain the origin of a fauna (that of Ireland in particular) by the careful study of its past and present faeces. Discussing the theories of northern and southern migration, and of the migration of the bulk of the original European fauna on land, he upholds the view that the present fauna and flora reached Ireland in a continuous stream from early Tertiary times onwards, and that many of its existing species have probably been there since the Eocene. He argues that little or nothing arrived after the earlier part of the Pleistocene—*i. e.* practically nothing since the Glacial Period.

He incidentally supports the theory of marine origin of the Boulder Clay, and materially so the argument in favour of ice-action in N. Europe being due to floating icebergs at sea, as distinct from land-ice; leading up to the final conclusion that Ireland became separated from England when the migrations from S. to Central Europe were in progress, and that the bulk of the animals which now inhabit England and Ireland are the descendants of ancestors which must have migrated over a land-surface not covered by ice.

The book is admirably got up, not its least attractive feature being the illustrations, which, though few, are in some cases new and highly welcome. Its weakest aspect appears to us the too great reliance on mere negative evidence, notoriously on the supposed scantiness of fossils in the Oligocene deposits, which for Ireland have yet to be adequately explored.

In questions of synonymy, there are some concerning which the author is by no means in agreement with precedent and prevailing custom, and it is a pity he is not more of a palæontologist. The general tone of the book is healthy in the extreme, well worthy its author's association with Haddon, Cunningham, and others, who are doing so much for natural science in the Green Isle. All things considered, the question whether the Irish fauna be glacial, pre- or post-glacial, is but of secondary importance in the production of the book. It is its author's great merit to have opened up a new line of thought on an important problem and worked it out at great pains. That his book will exercise a stimulating influence on Irish investigation is certain; and we could wish it no better outcome than that it might lead to an early exploration of the later and post-tertiary deposits of the area with which it deals, upon the evidence obtainable from which much that is advocated in its pages must stand or fall.

On Buds and Stipules. By the Right Hon. Sir JOHN LUBBOCK, Bart., M.P., F.R.S., D.C.L., LL.D. With Four Coloured Plates and 340 Figures in the Text. (International Scientific Series, vol. lxxxvi.) London: Kegan Paul, Trench, Trübner, & Co., Ltd. 1899. 8vo. Pp. xix, 233.

THIS volume consists of selections from three papers—"On Stipules, their Forms and Functions," and "On Buds and Stipules"—which

originally appeared in the 'Journal of the Linnæan Society' from 1891 to 1897, with the cuts and the coloured plates belonging to them; there are also added a few cuts from the author's 'Seedlings,' half a dozen from Bentham's 'Illustrated British Flora,' and some new half-tone blocks.

The scope of the work will be best understood by the titles of the contents of the nine chapters into which the book is divided:—On Buds; On Stipules; On the Development of Leaves and Stipules; On the Protection of Buds; On the Structure of Buds; On the Forms of Stipules; On the Subsidiary Uses of Stipules; On the Nature of Stipules; Summary.

It is somewhat difficult to guess the class of readers to whom this volume is addressed. While the style is simple and the various topics discussed without undue technicality, demands are made upon the reader's knowledge which are hardly likely to be met in the case of the average person. On the other hand, the nature of much of the information given may without offence be styled elementary; the subjects are introduced as they occur, without a strict sequence in any scientific order. The references and bibliography point to the conclusion that students are appealed to, and we must therefore conclude that both classes are addressed and that the volume is a compromise in that direction.

The forms of both buds and stipules are so various that it would be difficult to write on them without bringing together a large amount of interesting matter. It is so here, and the volume may be recommended to all who can take pleasure in examining the objects named on attention being drawn to the protean shapes in which the said organs occur. To enhance the interest of a stroll in the country or garden is well worth doing, and on that ground the present work may be commended.

A word may be added on the subject of references, which are sometimes given in the text, at others in footnotes, while a third method is also employed, that of sending the reader to the "Bibliography," consisting of rather more than two pages of titles of books and papers bearing on the topics handled. Unfortunately, as we think, the plan adopted is the singularly awkward one of setting out the entries in the order of citation in the text, as though the author drew up his list as he wrote his manuscript and printed it in the same sequence. To render the bibliography really useful it should have been drawn up either in the order of time—that is, chronologically—which would have shown the order of research from the first author mentioned to the last, or alphabetically by writers' names, which would have shown the relative sum of observation by each author named. By the present plan we have a series of entries without any obvious plan, compelling the reading of the whole in order to get at the items.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

May 24th, 1899.—W. Whitaker, B.A., F.R.S.,
President, in the Chair.

Prof. SEELEY exhibited a cast from a footprint obtained by Mr. H. C. Bensley from the Trias at Stourton. The impression is about $1\frac{1}{2}$ inch long, and nearly as wide. The cast has been treated by oblique illumination, so as to display its osteological structure by means of the shadows thus thrown. All the claws are directed outward, as in a burrowing animal. The form of the foot resembles that of a monotreme mammal rather than that of any existing reptile. There appears to be a slender pre-pollex including three bones. The only other example of this structure in the Trias is in the Theriodont reptile *Theriodon*, in which it is less definite. This character may add to the interest of other footprints from Stourton, which in the form of the foot approximate to Anomodont reptiles from the Karoo Beds of Cape Colony.

The following communications were read:—

1. 'On the Distal End of a Mammalian Humerus from Tonbridge.'
By Prof. H. G. Seeley, F.R.S., F.G.S.

The bone described in this communication was found in 1898 by Mr. Anderson on the bank of the River Medway, near Tonbridge. It was seen projecting from reconstructed rock which contained fragments of flints among other materials. Traces of matrix at the distal end show that the specimen has been derived from quartz-sand bound together with limonite, such as might occur in the Hastings Sand, Wealden Clay, or Lower Greensand. Conditions of mineral structure and osteological character incline the Author to believe that the bone was originally contained in the Wealden Clay. The fossil is 4 inches long, and indicates a humerus which may have been 6 inches in length when perfect, as large as that of a wolf but smaller than that of a bloodhound. The form of the shaft precludes any comparison with the carnivora, and indicates a resemblance to ungulate types. When the bone is held vertically and seen from the front, the condyles are oblique—a character not observed in any other animal. The weight of evidence appears to incline towards reference of the fossil to the Artiodactyla, but it probably indicates a new family type.

2. 'On Evidence of a Bird from the Wealden Beds of Ansty Lane, near Cuckfield.' By Prof. H. G. Seeley, F.R.S., F.G.S.

A fragment of bone found, by Mr. Neville Jones, a member of the London Geological Field Class, embedded in sandstone was identified by the Author as probably the distal end of the femur of a bird.

The external condyle is not only larger and deeper than the inner, but is more prolonged distally—perhaps the most distinctive avian character of the bone. *Columbus* is the only existing bird to which the fossil makes any approximation, but the resemblance is distant and not suggestive of near affinity, and it is interesting that the Cretaceous birds show so marked an affinity with that type. The resemblances of the Dinosaurian and Crocodilian femora with this type are such that almost every individual feature of the bone can be paralleled in some fossil referable to these groups, but there are no British dinosaurs of so small a size or possessing some of the marked features shown by this bone.

June 21st, 1899.—W. Whitaker, B.A., F.R.S.,
President, in the Chair.

The following communications were read:—

1. 'On some Ironstone Fossil Nodules of the Lias.' By E. A. Walford, Esq., F.G.S.

In the Lias of Oxfordshire some ironstone-nodules are found at the point of contact of the Middle and Upper Lias. 'The Middle Lias stone is compact, crystalline, and absorbent, and contains numerous irregular pyriform bodies,' some of which 'are changed wholly into a form of red hematite. These . . . bodies have a circular vertical canal or shaft . . . with the polyp and zooid-cells ranged round in obscure spiral growth. The cells have the areolated structure of the crinoids, or are spiculate of the type figured by Sars in *Pennatula*. Though in form approaching the *Cumacea*, the presence of perforated brachial plates, of annulated segments, and of spiculate zooidal cells, places the group between the *Pennatula* and the Crinoids. The resistance of the denser structure of the beds of calcareous stems of the rag-beds has caused the beds above and below them to become the lines of drainage, and hence [to become converted] into beds of greater ferruginous concentration.'

2. 'Additional Notes on the Vertebrate Fauna of the Rock-Fissure at Ightham (Kent).' By E. T. Newton, Esq., F.R.S., F.G.S.

Since the previous paper on the Ightham-fissure fauna published by this Society about five years ago, numerous additional specimens have been obtained, not only by Mr. Lewis Abbott, but also by Mr. Frank Corner and Mr. Kennard.

The present paper gives a very brief account of the new forms which have been discovered and identified during the last five years, with remarks upon some important additional remains of *Mustela robusta*, and of the *Spermophilus* which is now referred to the species *erythrogenoides* of Falconer. This paper adds some 19 new forms to the fauna of the Ightham fissure.

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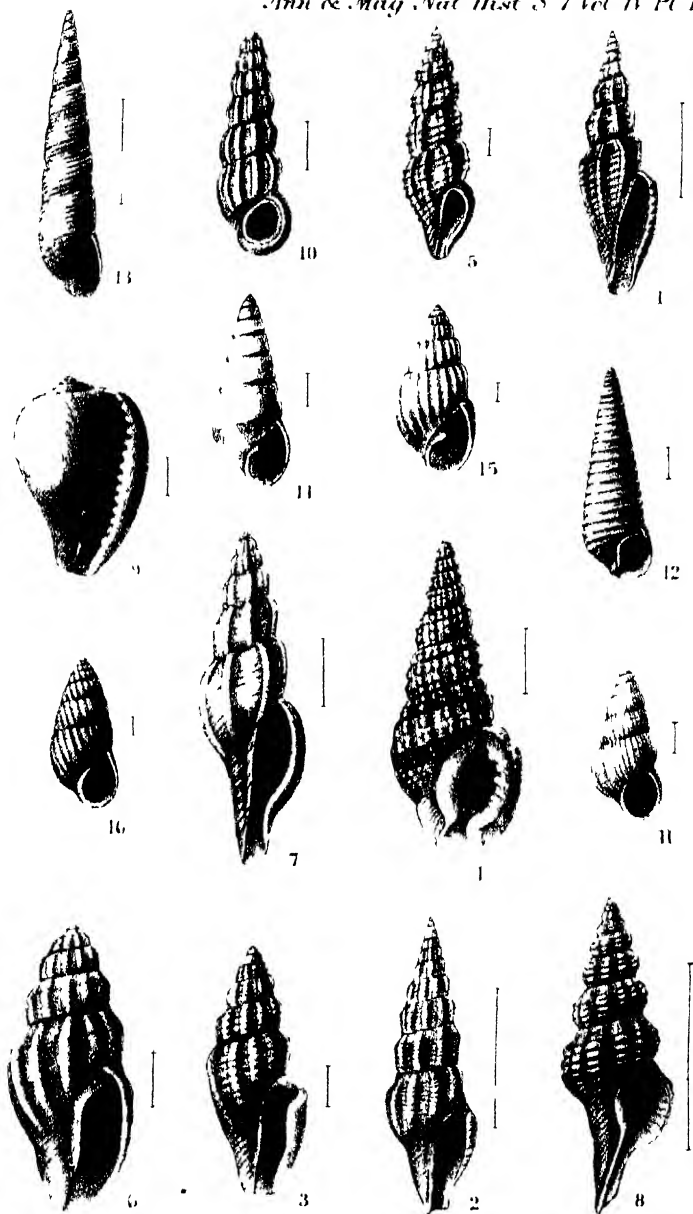
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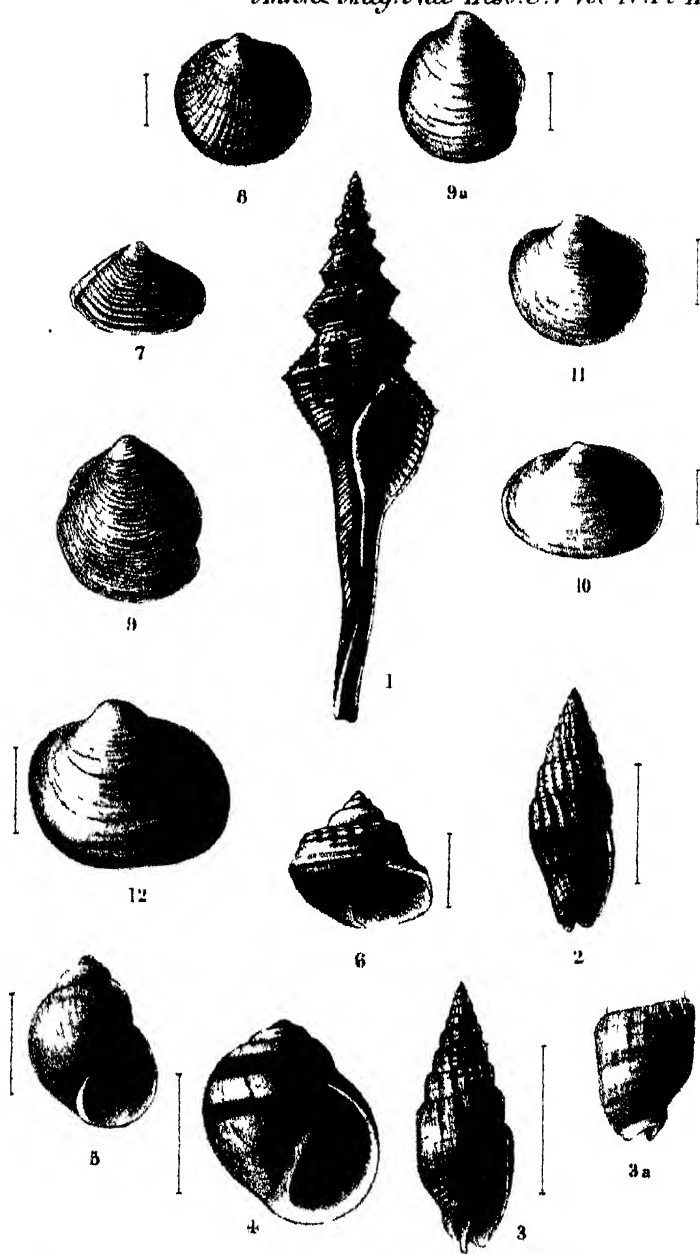
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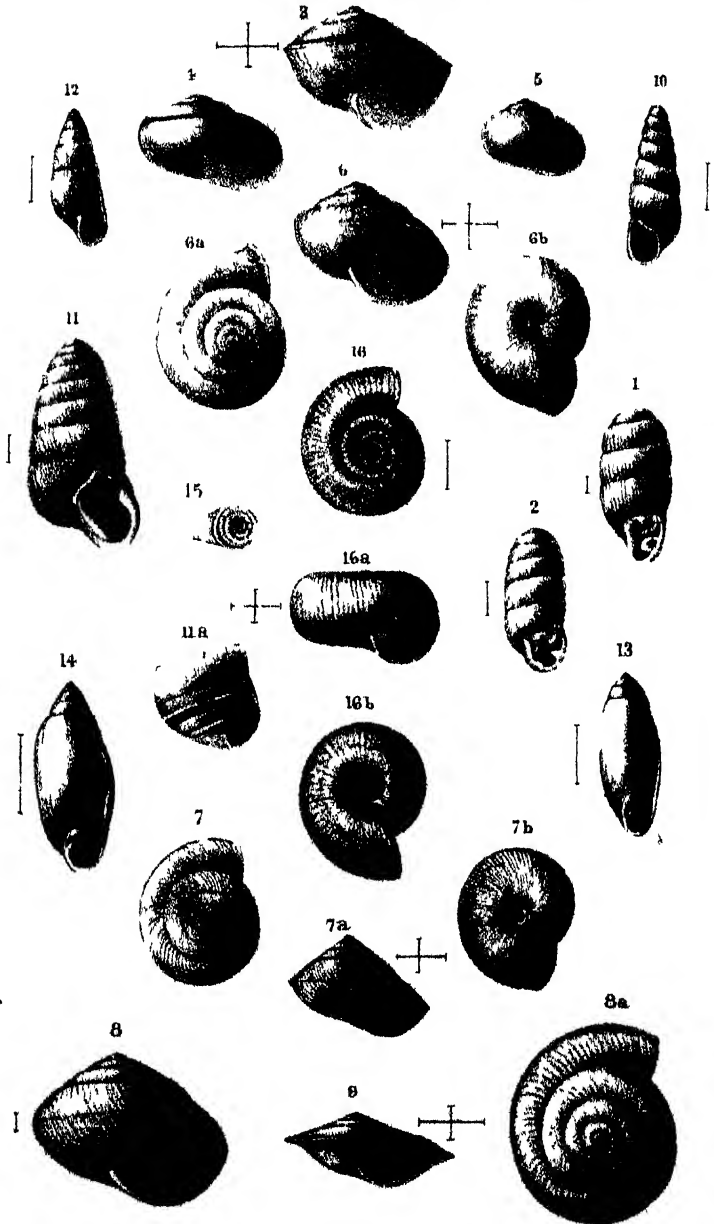
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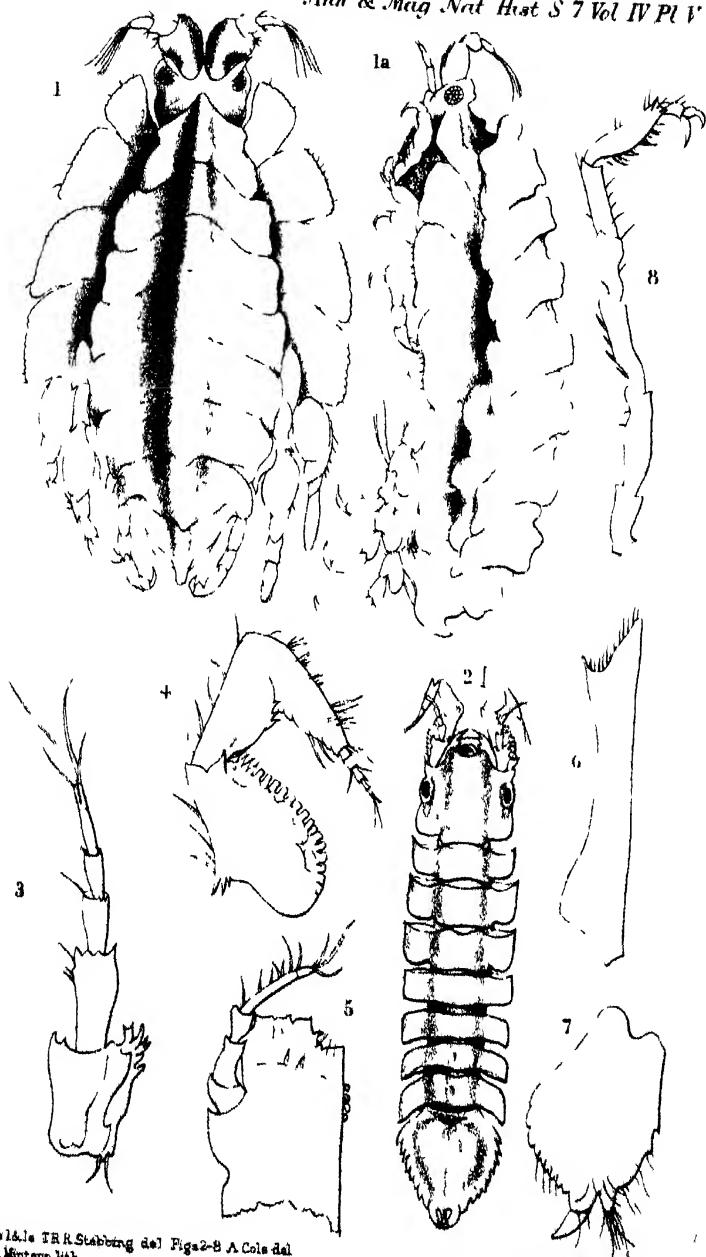
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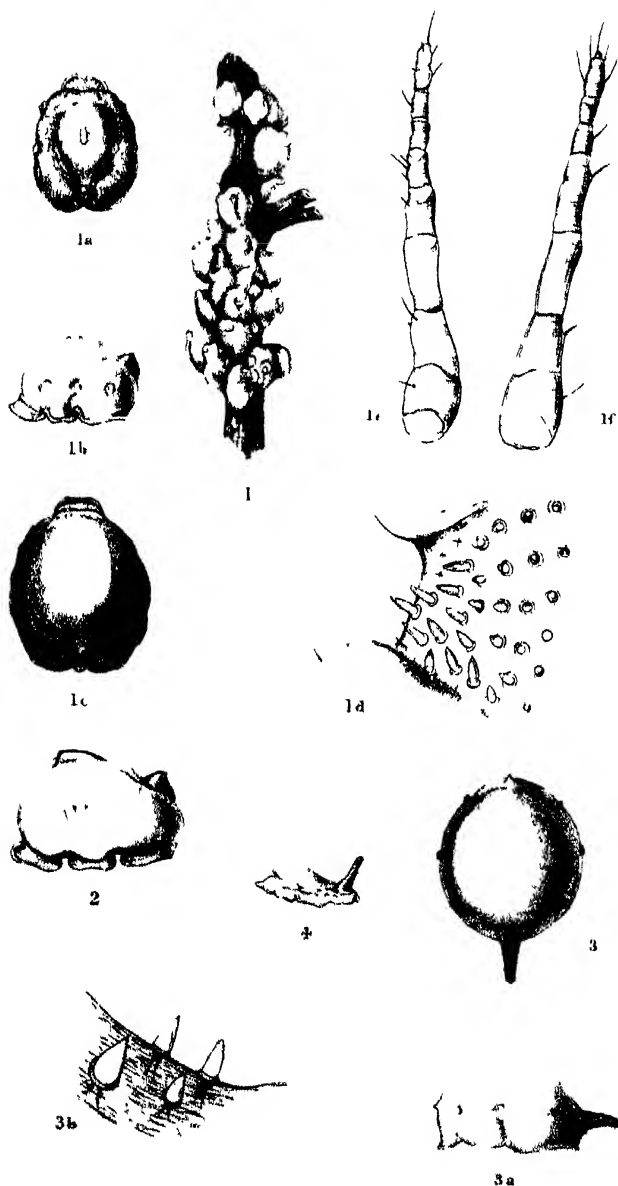


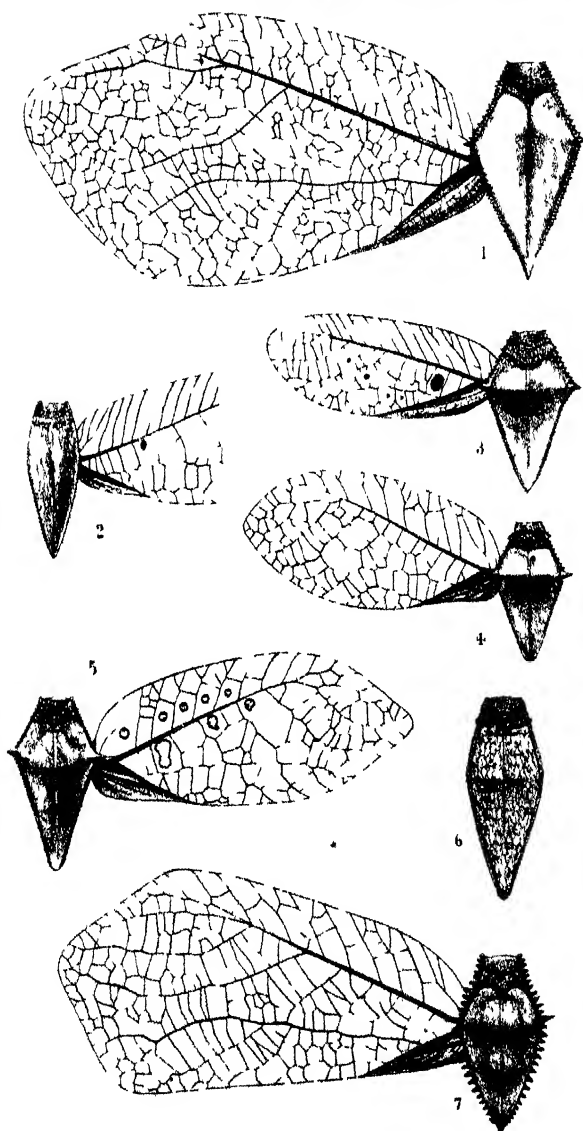




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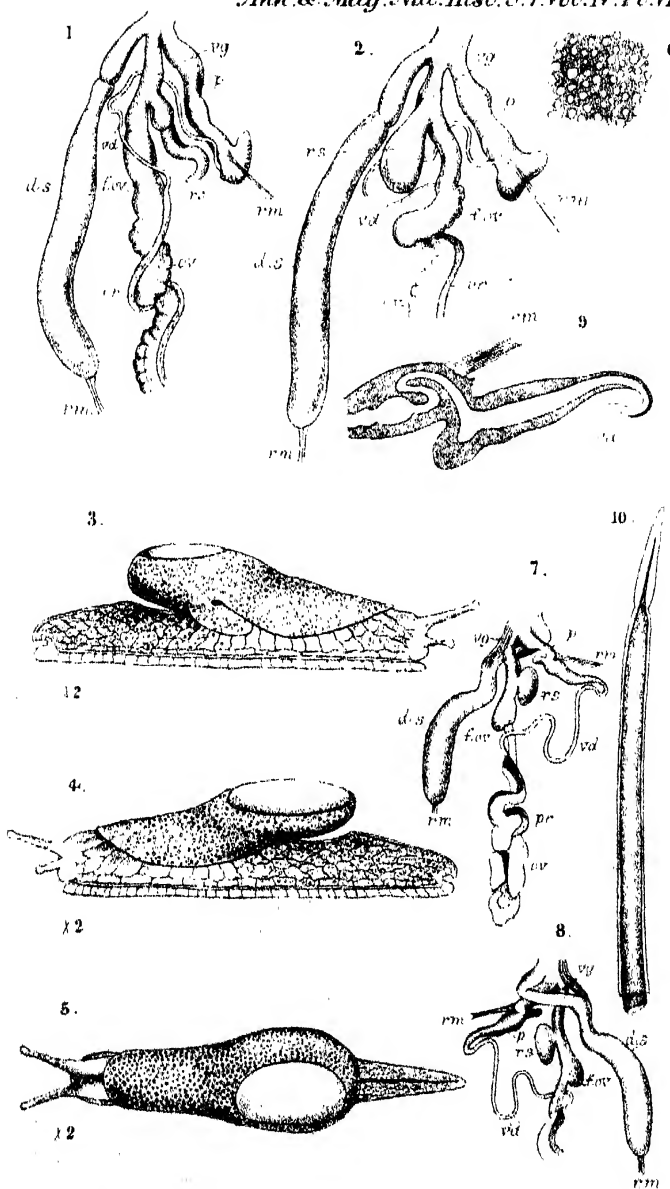




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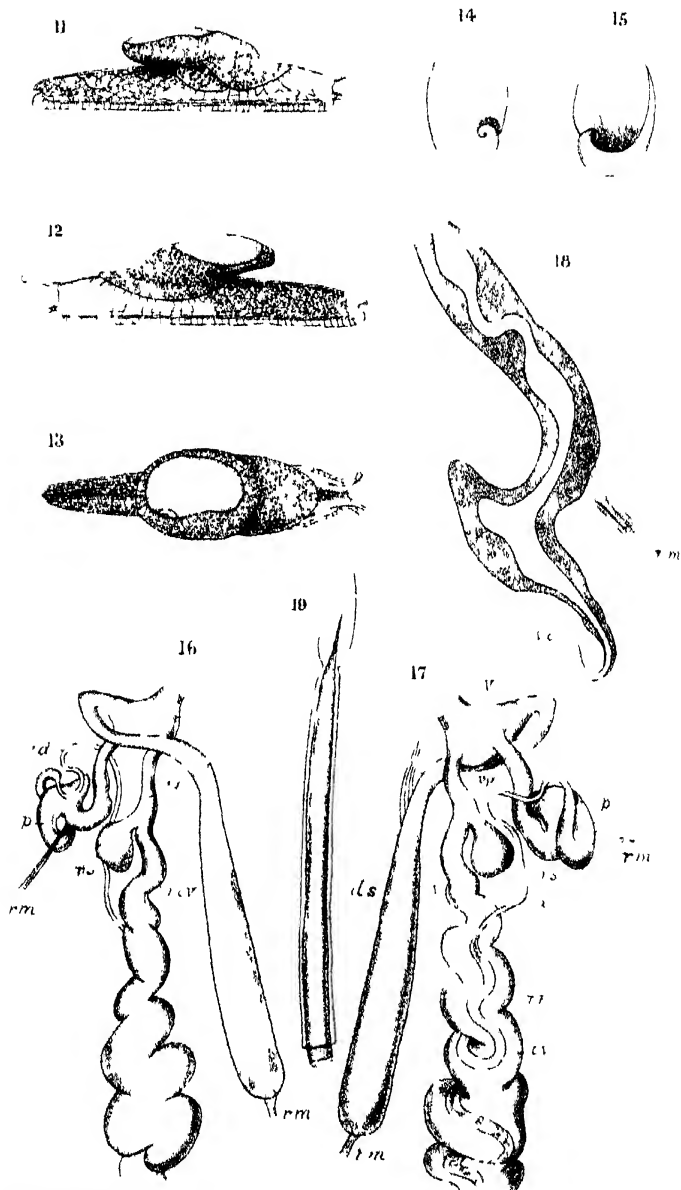
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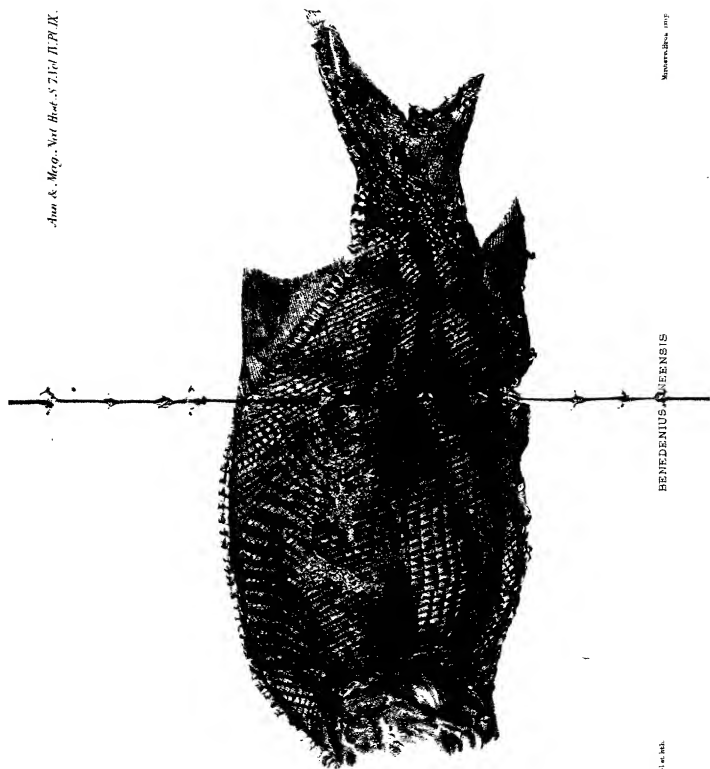
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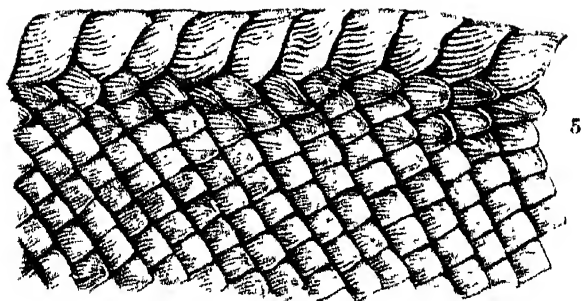
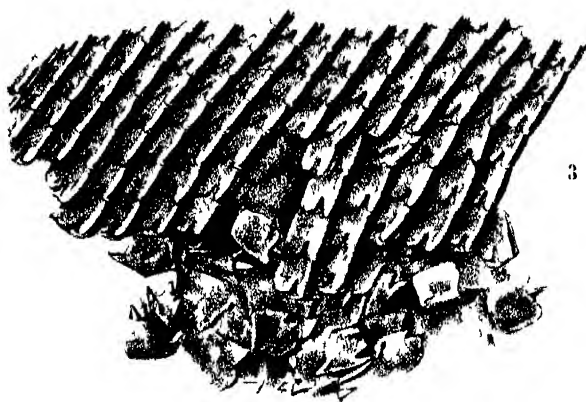
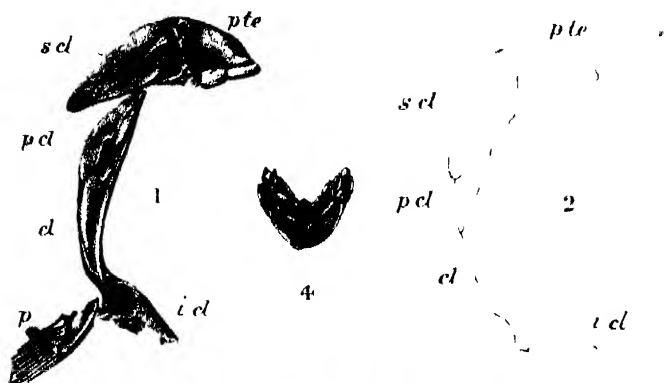
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